Feb 20 – 25, 2022
Big Sky Resort
Big Sky, Montana

Western Trauma Association

51ST ANNUAL MEETING

FINAL PROGRAM

SAVE THE DATE

52nd Annual Meeting
March 5 – 10, 2023

Western Trauma Association

FIFTY-FIRST ANNUAL MEETING

February 20 – 25, 2022
Big Sky Resort
Big Sky, Montana

Dear Members, Friends and Guests:

Welcome to this unprecedented and historic meeting of the Western Trauma Association in 2022. I have had the great honor and pleasure of presiding over the WTA for "The Meeting that Never Was" as well as the 51st Annual Meeting.

A lot of work has occurred during the year in preparation for this year's meeting with a special thanks going to Nick Namias MD and the members of the Program Committee who have done an outstanding job selecting the top abstracts from the excellent submitted work by our members and guests. I am very pleased that Elizabeth Kovacs PhD will be our Founders Basic Science Lecturer Wednesday morning.

Rochelle Dicker MD, Chair of the Injury Prevention Committee, has put together a very important panel discuss on Wednesday afternoon. We will have 4 WTA algorithms, 2 multicenter trials and 2 pro/con debates. One of the sessions that I hope you and your family will make a special effort to attend is the Paint the Ceiling lecture by Patrick Ireland.

The decision to host the WTA Annual meeting in person was made considering the safety of our members, families, and friends and the desire to re-establish the Fellowship of the Snow. We have learned a lot over the last 2 years about how to safely deal with COVID and hold safe gatherings. There have been numerous successful, large academic meetings with no reported outbreaks of COVID. The safety and experience of our members and guests with an in-person format is our highest priority. We ask that everyone follow the guidelines of the Association so we can have the safest possible meeting.

Finally, Big Sky has long held a special place in my memory book of ski resorts, and I am excited to bring our WTA family to this spectacular mountain. It has been 11 years since the WTA has held a meeting at Big Sky. I hope that you enjoy it and that it also creates a special memory for you.

Robert McIntyre, Jr., MD
President, Western Trauma Association

TABLE OF CONTENTS

CONTINUING MEDICAL EDUCATION CREDIT INFORMATION

Accreditation

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of American College of Surgeons and the Western Trauma Association. The American College of Surgeons is accredited by the ACCME to provide continuing medical education for physicians.

AMA PRA Category 1 Credits™

The American College of Surgeons designates this Other activity (hybrid: live, streaming and enduring) for a maximum of **19** *AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Of the *AMA PRA Category 1 Credits™* listed above, a maximum of **13** credits meet the requirements for Self-Assessment.

American College of Surgeons
Inspiring Quality: Highest Standards, Better Outcomes
100+years

ACCME ACCREDITED WITH COMMENDATION
AMERICAN COLLEGE OF SURGEONS DIVISION OF EDUCATION

CME INFORMATION

TO CLAIM CME

You will receive an email with instructions on completing the meeting evaluation, taking self-assessment tests and obtaining your CME Certificate. These instructions will be sent to the email you used to register for the meeting. Instructions will also be posted on the WTA website.The self-assessment tests will be available at the end of each day.

LEARNING OBJECTIVES

This activity is designed for physicians of all specialties who are involved in the care of trauma patients.

Upon completion of this course, attendees will be able to:

- Compare BCVI rates in persons with and without liberal screening
- Explain the relationship of trauma center density and outcomes
- Recognize the link between hypertonic saline infusion and mortality in TBI
- Assess the role of patient autonomy on end-of-life decisions
- Recognize the importance of early control of hemorrhage following injury
- Create optimal VTE prophylaxis protocols

DISCLOSURE INFORMATION

In compliance with the ACCME Accreditation Criteria, the American College of Surgeons must ensure that anyone in a position to control the content of the educational activity has disclosed all relevant financial relationships with any commercial interest. All reported conflicts are managed by a designated official to ensure a bias-free presentation. Please see the insert to this program for the complete disclosure list.

WTA MISSION STATEMENT

The Western Trauma Association is committed to the improvement of trauma care through research, education, sharing of clinical experiences, and the development of physicians of all specialties who are involved in the care of trauma patients. The goals of the Association are not only the intellectual growth attained through increased knowledge, but also the emotional growth attained through camaraderie and interaction with family and friends in an environment conducive to winter sports.

2020-2022 OFFICERS & COMMITTEE CHAIRS

Officers

President	Robert McIntyre, MD
President-Elect	Walter L. Biffl, MD
Vice President	Rosemary Kozar, MD
Secretary	Karen Brasel, MD
Treasurer	Richard Miller, MD
Immediate Past President	David V. Shatz, MD

Board of Directors	**Term Ends**
Dennis W. Vane, MD	2022
Rochelle Dicker, MD	2022
Mitch Cohen, MD	2022
Roxie M. Albrecht, MD	2023
Megan Brenner, MD	2023
Lawrence N. Diebel, MD	2023
S. Rob Todd, MD	2024
Benjamin Zarzaur, MD	2024
David V. Shatz	2024

2020-2022 OFFICERS & COMMITTEE CHAIRS

Historian	**Term Ends**
Mark Metzdorff, MD	2022
Program Chair	**Term Ends**
Nicholas Namias, MD	2022
Publications Chair	**Term Ends**
Marc de Moya, MD	2023
Multi-Center Trials Chair	**Term Ends**
Carlos Brown, MD	2022
Algorithms Chair	**Term Ends**
Matthew Martin, MD	2023
Nominating Chair	**Term Ends**
David V. Shatz, MD	2022

Social Media Ad-Hoc Chair
Bellal Joseph, MD

Violence Prevention Ad-Hoc Chair
Rochelle Dicker, MD

2020-2022 COMMITTEES

Program Committee	Term
Nicholas Namias, MD, Chair	2019-2022
Charles Cook, MD	2019-2022
Michael Aboutanos, MD	2019-2022
S. Rob Todd, MD	2019-2022
Andrew Rosenthal, MD	2019-2022
Susan Rowell, MD	2020-2023
Kevin Schuster, MD	2019-2022
Alexander Eastman, MD	2020-2023
Marc de Moya, MD, ex-officio	2020-2023
Carlos Brown, MD, ex-officio	2020-2022
Robert McIntyre, MD, ex-officio	2020-2022

Publications Committee	Term
Marc de Moya, MD Chair	2019-2023
Erik Barquist, MD	2019-2023
Kelley Bullard, MD	2019-2023
Joseph Galante, MD	2018-2022
Stephanie Gordy, MD	2019-2023
Mubeen Jafri, MD	2020-2023
Bellal Joseph, MD	2018-2022
Olga Kaslow, MD	2018-2022
Robert Letton, MD	2016-2022
James McCarthy, MD	2016-2022
David Shultz, MD	2019-2023
David Zonies, MD	2019-2023

2020-2022 COMMITTEES

Algorithms Committee	Term
Matthew Martin, MD, Chair	2019-2023
Eric Ley, MD	2019-2023
Anne Rizzo, MD	2018-2022
Carlos Brown, MD	2019-2023
Jason Sperry, MD	2018-2022
Nelson Rosen, MD	2019-2022
Jennifer Hartwell, MD	2020-2024
Kenji Inaba, MD	2020-2023
Kimberly Peck, MD	2019-2023
Jordan Weinberg, MD	2020-2024
Marc de Moya, MD, ex-officio	2020-2023
Karen Brasel, MD, ex-officio	2018-2024
Raul Coimbra, MD, ex-officio	

Nominating Committee	Term
David Shatz, MD, Chair	2022
Dennis Vane, MD	2022
Roxie Albrecht, MD	2022
Michael Truitt, MD	2022
Stephany Berry, MD	2022

Multi-Center Trials Committee	Term
Carlos Brown, MD, Chair	2018-2022
Eric Ley, MD	2019-2022
Michael Truitt, MD	2019-2023
Clay Cothren Burlew, MD	2019-2023
Laura Moore, MD	2019-2023
Kenji Inaba, MD	2019-2022
Matthew Martin, MD	2019-2022

2020-2022 COMMITTEES

Violence Prevention Ad-Hoc Committee
Rochelle Dicker, MD, Chair
Kelley Bullard, MD
Alex Eastman, MD
Bryan Collier, MD
John Vermillion, MD
Amy Wyrzykowski, MD

Social Media Ad-Hoc Committee
Bellal Joseph, MD Chair
Matthew Martin, MD
Alexis Moren, MD
Lucy Kornblith, MD
Mark Seamon, MD
David Skarupa, MD

WTA PRESIDENTS

Robert G. Volz, MD	1971	Vail
Robert G. Volz, MD	1972	Vail
Peter V. Teal, MD	1973	Vail
William R. Hamsa, MD	1974	Aspen
Arthur M. McGuire, MD	1975	Sun Valley
Lynn Ketchum, MD	1976	Snowmass
Fred C. Chang, MD	1977	Park City
Glen D. Nelson, MD	1978	Steamboat
Gerald D. Nelson, MD	1979	Snowmass
Kevin G. Ryan, MD	1980	Snowbird
David S. Bradford, MD	1981	Jackson Hole
Erick R. Ratzer, MD	1982	Vail
William R. Olsen, MD	1983	Jackson Hole
Earl G. Young, MD	1984	Steamboat Springs
Robert B. Rutherford, MD	1985	Snowbird
Rudolph A. Klassen, MD	1986	Sun Valley
Robert J. Neviaser, MD	1987	Jackson Hole
Robert C. Edmondson, MD	1988	Steamboat Springs
Ernest E. Moore, MD	1989	Snowbird
Stephen W. Carveth, MD	1990	Crested Butte
George E. Pierce, MD	1991	Jackson Hole
Peter Mucha, Jr., MD	1992	Steamboat Springs
David V. Feliciano, MD	1993	Snowbird
R. Chris Wray, MD	1994	Crested Butte
David A. Kappel, MD	1995	Big Sky
Thomas H. Cogbill, MD	1996	Grand Targhee
G. Jerry Jurkovich, MD	1997	Snowbird
James B. Benjamin, MD	1998	Lake Louise
Herbert J. Thomas III, MD	1999	Crested Butte
Barry C. Esrig, MD	2000	Squaw Valley
Steven R. Shackford, MD	2001	Big Sky
James A. Edney, MD	2002	Whistler-Blackcomb
J. Scott Millikan, MD	2003	Snowbird
Harvey J. Sugerman, MD	2004	Steamboat Springs
Scott R. Petersen, MD	2005	Jackson Hole
Harold F. Sherman. MD	2006	Big Sky

WTA PRESIDENTS

Frederick A. Moore, MD	2007	Steamboat Springs
James W. Davis, MD	2008	Squaw Valley
Grace S. Rozycki, MD	2009	Crested Butte
Robert C. Mackersie, MD	2010	Telluride
M. Gage Ochsner, MD	2011	Big Sky
R. Lawrence Reed, MD	2012	Vail
Mark T. Metzdorff, MD	2013	Snowmass
David H. Livingston, MD	2014	Steamboat Springs
Christine S. Cocanour, MD	2015	Telluride
Thomas M. Scalea, MD	2016	Squaw Valley
Carl J. Hauser, MD	2017	Snowbird
Dennis W. Vane, MD	2018	Whistler
Roxie M. Albrecht, MD	2019	Snowmass
David V. Shatz, MD	2020	Sun Valley
Robert McIntyre, MD	2022	Big Sky

NEW MEMBERS

Western Trauma Association Welcomed the Following New Members in 2020 & 2021:

Vaidehi Agrawal, PhD
Baltimore, MD
Associate Member

Ronald Barbosa, MD
Portland, OR
Surgical Critical Care
Active Member

Stepheny Berry, MD
Kansas City, KS
General Surgery
Active Member

Scott Brakenridge, MD
Gainsville, FL
Surgical Critical Care
Active Member

Rachel Callcut, MD
Sacramento, CA
Surgical Critical Care
Active Member

Matthew Carrick, MD
Southlake, TX
General Surgery
Active Member

Warren Dorlac, MD
Loveland, CO
Surgical Critical Care
Senior Member

Evert Eriksson, MD
Charleston, SC
General Surgery
Active Member

Stephen Hafertepen, MD
Aurora, CO
Surgical Critical Care
Senior Member

Dmitriy Karev, MD
Bronx, NY
Surgical Critical Care
Senior Member

Natasha Keric, MD
Phoenix, AZ
General Surgery
Active Member

Nathaniel Kreykes, MD
Minneapolis, MN
Pediatric Surgery
Active Member

NEW MEMBERS

Western Trauma Association Welcomed the Following New Members in 2020 & 2021 (continued)

Gregory Magee, MD MSc
Los Angeles, CA
Vascular Surgery
Active Member

Lesley Osborn, MD
Houston, TX
Emergency Medicine
Active Member

Shad Pharaon, MD
Vancouver, WA
Surgical Critical Care
Active Member

Samuel Prater, MD
Houston, TX
Emergency Medicine
Active Member

Daniel Rossi, DO
Anchorage, AK
Colorectal Surgery
Active Member

Ronald Tesoriero, MD
Baltimore, MD
Surgical Critical Care
Active Member

WESTERN TRAUMA FOUNDATION DONORS

Current lifetime accumulation status based on 2021 year end

Summit
($25,000 and up)

Barry Esrig
Eric Ley
Ernest Moore
Thomas Scalea
Robert Volz

Extreme
($10,000-24,999)

Roxie Albrecht
Gregory Campbell
Christine Cocanour
James Davis
David Feliciano
David Livingston
Grace Rozycki

Couloir Society
($5,000 – $9,999)

Kimberly Davis
K Dean Gubler
Krista Kaups
David Kissinger
Matthew Martin
Robert McIntyre
Mark Metzdorff
Andy Michaels
Scott Millikan
Robert Neviaser
Kimberly Peck
Scott Petersen
R. Lawrence Reed
Steven Shackford
David Shatz
Herbert Thomas
Dennis Vane
Jennifer Watters

WESTERN TRAUMA FOUNDATION DONORS

Double Black Diamond Club
($2,500 - $4,999)

John Adams
Denis Bensard
Marilu Bintz
Karen Brasel
Lawrence Diebel
George Dulabon
Soumitra Eachempati
Charles Fox
Enrique Ginzburg
James Haan
Gregory Jurkovich
David Kappel
Peggy Knudson
Rosemary Kozar
Rick Leone
Robert Letton
Manny Lorenzo
Robert Mackersie
Ajai Malhotra
James McCarthy
Frederick Moore
Steven Moulton
Patrick Offner
Anne Rizzo
Steven Ross
R. Stephen Smith
Keith Stephenson
Harvey Sugerman
S. Rob Todd

Black Diamond Circle
($1,000 - $2,499)

Michel Aboutanos
Hasan Alam
Bonny Baron
Erik Barquist
James Benjamin
Allison Berndtson
Walter Biffl
Megan Brenner
Carlos Brown
Kelley Bullard
Clay Burlew
David Ciesla
Thomas Cogbill
Mitchell Cohen
Raul Coimbra
Alain Corcos
Marc de Moya
Rochelle Dicker
Doreen DiPasquale
Carl Hauser
Stephanie Ireland
Gordy
Laura Johnson
Dmitriy Karev
Riyad Karmy-Jones
Natasha Keric
Brent King
Guy Lanzi
William Long
Heather MacNew
Barbara Mainville
John McGill
Richard Miller
Laura Moore
Nicholas Namias
M. Gage Ochsner
Keith O'Malley
Jasmeet Paul
Peter Rhee
Susan Rowell
Martin Schreiber
Kevin Schuster
Aaron Scifres
Harold Sherman
Ali Tabatabai
Mark Tellez
Desarom Teso
Brian Tibbs
Eric Toschlog
Mike Truitt
Steven Wald
Michaela West
Robb Whinney

WESTERN TRAUMA FOUNDATION DONORS

Blue Trail Associate
($500 - $999)

Raeanna Adams
Scott Armen
Paul Beery
Howard Champion
Roy Cobean
Bryan Collier
Charles Cook
Todd Costantini
Alisa Cross
James Cushman
Julie Dunn
Brian Eastridge
Matthew Eckert
Bruce G Ferris
Alvaro Fonseca
Richard Gamelli
Rajesh Gandhi
Larry Gentilello
John Hall
Michael Hauty
David Hoyt
Olga Kaslow
Matthew LaPorta
Ralph Layman
Alicia Mangram
Ashraf Mansour
Alan Marr
Caleb Mentzer
Margaret Morgan
Frank Nastanski
Raminder Nirula
Michael Norman
David Notrica
Patrick O'Neill
Brianne Peltz
John B Pickhardt
Soula Priovolos
Basil Pruitt
Nelson Rosen
Andrew Rosenthal
Henry Sagi
Stephanie Savage
Henry Schiller
Thomas Schroeppel
Mark Shapiro
Deborah Stein
George Testerman
Gary Vercruysse
Libby Windell
R. Christie Wray, Jr.
Ben Zarzaur

WESTERN TRAUMA FOUNDATION DONORS

Green Trail Associate
(up to $499)

Chip Baker
Christopher Barrett
Marshall Beckman
Elizabeth Benjamin
Stepheny Berry
Scott Brakenridge
Saskya Byerly
Michael Cain
Rachael Callcut
Matthew Carrick
Donald Carter
Thomas Carver
Christine Ciszek
Michael Cripps
Martin Croce
Brandy Cross
Dan Cullinane
Matthew Davis
Andrew Dennis
Jody Digiacomo
Warren Dorlac
Alexander Eastman
Joel Elterman
loic fabricant
Mark Falimirski
Ara Feinstein
John Fildes
Warren Gall
Andrew Gaugler
Ernest Gonzalez
Rajan Gupta
Paul Harrison
James Hebert
Jeff Heisler
Brian Hoey
Kenji Inaba
Jay Johannigman
Ryan Kennedy
John Kepros
Barbara Latenser
David Leshikar
Charles Mains
Robert Maxwell
Lisa McMahon
Sarah Moore
Charlene Nagy
Todd Neideen
Jamison Nielsen
Robert O'Connor
Kumash Patel
Erik Peltz
Laurens Pickard
George Pierce
Rebecca Plevin
Bruce Potenza
Paul Reckard
Eugene Reilly
Dorothy Rowe
Ed Rutherford
Jack Sava
Carol Schermer
David Skarupa
Chance Spalding
Kurt Stahlfeld
Ronald Tesoriero
Ricard Townsend
Pascal Udekwu
Daniel Vargo
Charles Wade
Jordan Weinberg
Scott Welle
William Wilson
Amy Wyrzykowski

IN MEMORIAM

Earl G. Young, MD — February 27, 1989

Gerald S. Gussack, MD — August 25, 1997

Peter Mucha, Jr., MD — August 9, 2006

W. Bishop McGill, MD — October 14, 2007

Ronald P. Fischer, MD — January 25, 2013

M. Gage Ochsner, MD — April 26, 2013

George Cierny, MD — June 24, 2013

R. Christie Wray, MD — November 18, 2013

Robert B. Rutherford, MD — November 22, 2013

Doreen DiPasquale, MD — January 7, 2014

Barbara Latenser, MD — June 15, 2015

Matthew L Davis, MD — September 3, 2015

Arthur M. McGuire, MD — January 28, 2016

Glen D. Nelson, MD — May 14, 2016

William R. Olsen — June 14, 2017

Erick R. Ratzer, MD — July 7, 2017

Stephen W. Carveth, MD — March 6, 2019

Basil A. Pruitt Jr., MD — March 17, 2019

Peter V. Teal, MD — February 16, 2020

Robert C. Edmondson, MD — June 5, 2020

George E. Pierce, MD — June 18, 2020

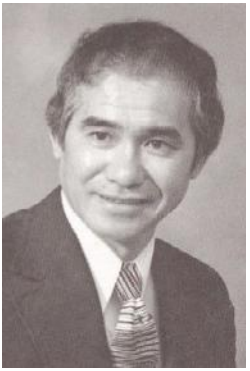
Harvey J. Sugerman, MD — August 9, 2020

Michael A. Dubick, MD — November 13, 2020

Joseph C. Stothert, MD, PhD — March 5, 2021

James A. Edney, MD — August 7, 2021

EARL YOUNG RESIDENT PRIZE FOR CLINICAL RESEARCH



Earl G. Young, MD
(1928-1989)

The Earl Young Resident Prize for Clinical Research was established after the death of one of the Founding members of the Western Trauma Association. This prize is a continuation of Dr. Young's profound interest in the training of residents and his commitment to ongoing research. It is given each year to stimulate resident clinical research. Abstracts eligible for this award are submitted to the Program Committee for resident prize status and presentation at the annual meeting of the Western Trauma Association. A manuscript must be submitted to the *Journal of Trauma and Acute Care Surgery* in advance of the meeting for consideration of publication. The manuscript and presentation are judged with first and second place cash prizes and recognition given at the annual WTA annual banquet. The 1st place resident's name is listed in the annual meeting program book.

Dr. John Najarian characterizing Earl at a memorial service in his honor at the University of Minnesota:

Dr. Earl G. Young of Minneapolis was a founding member of the Western Trauma Association and its 14th President. He died of a myocardial infarction, Monday, February 27, 1989, while skiing at Snowbird during the 19th Annual Meeting of the Association.

Dr. Young received his medical degree from the University of Rochester, N.Y. and Ph.D. in surgery from the University of Minnesota. He completed advanced training in cancer research at Harvard, a fellowship in cardiovascular surgery at Baylor University in Houston and studied microvascular surgery at the University of California–San Diego.

EARL YOUNG RESIDENT PRIZE FOR CLINICAL RESEARCH

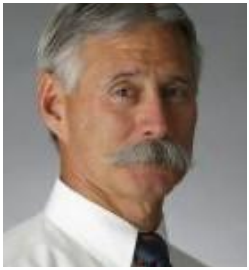
He was a clinical professor of surgery at the University of Minnesota Medical School, and a practicing general and vascular surgeon at the Park-Nicollet Clinic in Minneapolis from 1960. He was nationally known and was actively involved in research and education throughout his career. In 1988, one year before his untimely death, he received the Owen H. Wangensteen Award for Academic Excellence from the University of Minnesota Health Science Center. It was awarded by an unprecedented unanimous vote of all 72 surgical residents.

The Residents Paper competition was begun in 1991 as a tribute to Dr. Young's memory and his "spirit of inquiry, love of learning ... and commitment in service to mankind."

EARL G. YOUNG AWARD RECIPIENTS

Resident	Institution	Year
Joseph Schmoker, MD	University of Vermont	1991
Joseph Schmoker, MD	University of Vermont	1992
Charles Mock, MD	University of Washington	1993
Gino Travisani, MD	University of Vermont	1994
Phillip C. Ridings, MD	Medical College of Virginia	1995
David Han, MD	Emory University	1996
Preston R. Miller, MD	Wake Forest University	1997
Geoffrey Manley, MD, PhD	University of California, San Francisco	1998
James M. Doty, MD	Medical College of Virginia	1999
David J. Ciesla, MD	Denver Health/University of Colorado	2000
Ricardo J. Gonzales, MD	Denver Health/University of Colorado	2001
Scott C. Brakenridge, MD	Cook County Hospital	2002
Adena J, Osband, MD	UMDNJ-New Jersey Medical School	2003
Cindy Lee, MD	UMDNJ-New Jersey Medical School	2004
Ernest A. Gonzalez, MD	University of Texas at Houston	2005
Jennifer M. Watters, MD	Oregon Health & Science University	2005
Jennifer J. Wan, MD	University of California, San Francisco	2006
Jennifer J. Wan, MD	University of California, San Francisco	2007
Keir J. Warner, MD	University of Washington	2008
T. W. Constantini, MD	University of California, San Diego	2009
C. Anne Morrison, MD	Baylor College of Medicine	2010
Marlin Causey, MD	Madigan Army Medical Center	2011
Phillip Letourneau, MD	University of Texas at Houston	2011
Gerard De Castro, MD	University of Maryland	2011
Matthew E. Kutcher, MD	University of California, San Francisco	2012
Kimberly Song, MD, MA	UMDNJ – New Jersey Medical School	2013
Lucy Kornblith, MD	UCSF/SFGH, San Francisco	2014
Hunter B. Moore, MD	Denver Health/University of Colorado	2015
George Black, MD	Madigan Army Medical Center	2016
Morgan Barron, MD	Madigan Army Medical Center	2017
John Kuckelman, MD	Madigan Army Medical Center	2018
Patrick Murphy, MD	Indiana University	2019
Alexandra Dixon, MD	Oregon Health & Science University	2020

ERNEST E. MOORE RESIDENT PRIZE FOR BASIC SCIENCE RESEARCH



Ernest E. Moore

ERNEST E. MOORE PRIZE FOR BASIC SCIENCE RESEARCH

The Ernest E. Moore Resident Prize for Basic Science Research has been established to encourage residents to become surgeon researchers. Dr. "Gene" Moore has been a major factor in the academic growth of the Western Trauma Association by encouraging resident attendance and participation in the program at the Annual Meeting of the WTA. Abstracts eligible for this award are submitted to the Program Committee for resident prize status presentation at the annual meeting of the Western Trauma Association. A manuscript must be submitted to the *Journal of Trauma and Acute Care Surgery* in advance of the meeting for consideration of publication. The manuscript and presentation are judged with first and second place cash prizes and recognition given at the annual WTA annual banquet. The first-place resident's name is listed in the annual meeting program book.

Resident	Institution	Year
Anders Davidson, MD	University of California, Davis	2019
Zachary Matthay, MD	University of California, San Francisco	2020

ERNEST E. MOORE

Ernest E. Moore, M.D. F.A.C.S., M.C.C.M., F.A.C.N., F.A.C.E.P. (Hon), F.R.C.S. Ed. (Hon) F.R.C.S.T.(Hon), F.R.C.S.I.(Hon), F.E.B.S. Em Surg (Hon) first attended the WTA in 1977 and was the 19th president in 1989. He was the first member to sponsor surgical residents at the WTA and negotiated an affiliate society status of the WTA with the Journal of Trauma in 1985. Dr Moore was the Chief of Trauma at the Denver General Hospital for 36 years, Chief of Surgery for 28 years, the first Rockwell Distinguished Chair in Trauma Surgery, and a Distinguished Professor of Surgery at the University of Colorado Denver. Under Dr. Moore's leadership, the Denver General became internationally recognized for innovative care of the injured patient, and its trauma

ERNEST E. MOORE RESIDENT PRIZE

research laboratory has been funded by the NIH for 30 consecutive years. His team has made seminal contributions in defining the lethal triad of trauma induced coagulopathy, the two-hit model of multiple organ failure, the role of mesenteric lymph in post-shock lung injury, and the pathophysiology of fibrinolysis shutdown. In July 2018, the center was renamed the Ernest E Moore Shock Trauma Center at Denver Health. Dr. Moore has served as president of nine academic societies, including the Society of University Surgeons, American Association for the Surgery of Trauma, International Association for the Trauma and Surgical Intensive Care, and the World Society of Emergency Surgery; and was Vice President for the American Surgical Association. His awards include the Robert Danis Prize from the Society of International Surgeons, Orazio Campione Prize from the World Society of Emergency Surgery, Philip Hench Award from the University of Pittsburgh, Florence Sabin Award from the University of Colorado, Medallion for Scientific Achievement from the American Surgical Association, Lifetime Achievement Award from the Society of University Surgeons, Lifetime Achievement Award from the American Heart Association, Distinguished Investigator Award from the American College of Critical Medicine, Distinguished Investigator Award from the Shock Society, and Lifetime Service Award from the International Association for Trauma and Surgical Intensive Care. He has honorary fellowships in the Royal College of Surgeons of Edinburgh, the Royal College of Surgeons in Ireland, the Royal College of Surgeons of Thailand; and is an honorary member of the Brazilian Trauma Society, Colombian Trauma Society, European Society for Trauma and Emergency Surgery, and Trauma Association of Canada. Dr. Moore is coeditor of the textbook Trauma, in its 9th edition, Surgical Secrets in its 7th edition, and Trauma Induced Coagulopathy, in its 2nd edition; he has >1700 publications and has lectured extensively throughout the world. He is married to Sarah Van Duzer Moore, M.D., an internist at the University of Colorado Denver, and they have two sons; Hunter, a chief surgical resident at UCD and Peter, a pulmonary fellow at UCD. Dr. Moore's additional interests include endurance sports, mountaineering, skiing, and wapiti pursuit. He lives by the principle to work hard you must play hard, with the understanding that family is the ultimate priority.

PRESIDENTIAL ADDRESS

The VIPoma

Tuesday, February 22
5:00 pm – 6:00 pm

Robert McIntyre, Jr., MD
Denver, Colorado

Dr. McIntyre did his undergraduate work at Vanderbilt University then earned his MD in his hometown of New Orleans at Tulane University School of Medicine. He completed surgical internship and residency at the University of Colorado Health Sciences Center before joining the faculty as a senior instructor in 1992 for only 1 year. During this year he trained in Surgical Critical Care. He stayed in Denver and took over as Chief of Endocrine Surgery from Dale Leichty MD. In 1996 he became the Trauma and Surgical Critical Care Medical Director at University of Colorado Hospital. Now 30 years later he is still in Denver and is currently The Cynthia H and John H Schultz Professor and Chief of the Division of GI, Trauma and Endocrine Surgery (GITES). Additionally, he is the Vice Chair of the Department of Surgery for Finance at the University of Colorado School of Medicine and the Associate Chief Medical Officer for Surgery at University of Colorado Hospital. He has published over 225 manuscripts and 57 book chapters. He is the Editor of the textbook Surgical Decision Making. He has given over 200 invited lectures and visiting professor presentations and 150 research presentations. He is a member of numerous surgical societies and has served on numerous national committees. He served as President of the Southwestern Surgical Congress in 2012.

"PAINT THE CEILING" LECTURESHIP

In 1997, Dr. Gregory "Jerry" Jurkovich delivered his Presidential Address entitled "Paint the Ceiling: Reflections on Illness". This was a personal account of his battle with non-Hodgkin's lymphoma. His deep insights were shared from a patient's perspective, even that of a stained ceiling that he observed while lying on his back. He proposed that future WTA Scientific Programs have some time "dedicated to our patients and to the Art of Medicine".

This lecture has become an annual invited lecture which is integral to the unique identity of the Western Trauma Association Annual Meeting. Unlike the scientific session program, this lecture focuses on the humanistic aspects of medicine and can be attended by all participants, guests, and their families. Past lectures have been personal, local, national, and global, covering topics such as first-person accounts of illness, social and societal aspects that affect all patient care, programs providing relief in troubled or impoverished areas, or personal reflections on delivering care in a humane, holistic fashion. A speaker is chosen annually by the current President of the WTA. The Western Trauma Foundation provides an honorarium and expenses for this lecture.

"PAINT THE CEILING" LECTURESHIP

Presenter	Year	Location
G. Jerry Jurkovich, MD	1997	Snowbird
John W. McGill, MD	1998	Lake Louise
William T. Close, MD	1999	Crested Butte
Jimmy Cornell	2000	Squaw Valley
Geoff Tabin, MD	2001	Big Sky
James H. "Red" Duke, MD	2002	Whistler
David V. Shatz, MD	2003	Snowbird
Susan and Tim Baker	2004	Steamboat Springs
Alex Habel, MD	2005	Jackson Hole
Andrew Schneider	2006	Big Sky
Ernest E. Moore, MD	2007	Steamboat Springs
Pamela Kallsen	2008	Squaw Valley
Sylvia Campbell, MD	2009	Crested Butte
William Schecter, MD	2010	Telluride
Jeff McKenney, MD	2011	Big Sky
Larry M. Gentilello, MD	2012	Vail
Neil L. Barg, MD	2013	Snowmass
Ziad Sifri, MD	2014	Steamboat Springs
Julie Freischlag, MD	2015	Telluride
Lewis Rubinson, MD, PhD	2016	Squaw Valley
Kenneth Waxman, MD	2017	Snowbird
Steven R. Shackford, MD	2018	Whistler
M. Margaret Knudson, MD	2019	Snowmass
MSgt Chris Willingham	2020	Sun Valley

PAINT THE CEILING LECTURE

COLUMBINE: TRAGEDY TO TRIUMPH

Thursday, February 24
5:00 pm – 6:00 pm

Patrick J. Ireland

Patrick Ireland is a Wealth Management Advisor with the Northwestern Mutual Wealth Management Company in Golden, CO. He was born and raised in Denver, Colorado, has been married to his wife Kacie since 2005 and they have 3 children: Kennedy, Kensington, and Keene.

During the spring of his junior year of high school, Pat's life took a dramatic change. On April the 20th, 1999, two students embarked on a shooting rampage at Columbine High School in Littleton, CO, killing 12 students and a teacher, as well as wounding 23 others, before taking their own lives. Pat was shot twice in the head, and once in the foot, and was left for dead.

This was the horrific experience that brought him to St. Anthony's Central and Craig Rehabilitation Hospital. During his time at Craig, much like many other patients, he participated in extensive speech, physical, and occupational therapy. Pat spent 7 months in in-patient and out-patient care at Craig before heading back to school to finish his senior year at Columbine where he graduated Valedictorian with his class and went on to graduate Magna Cum Laude from Colorado State University in May 2004.

These experiences and his positive, can-do attitude have led to the opportunity to share his story of strength, courage, and overcoming obstacles to a variety of business, youth, and school organizations. Along the way, he's considered the life lessons that can be learned from this tragedy and believes that there is still good in the world regardless of negative news, perseverance can lead to achieving greatness, and the fact that we all have a choice to live as a victor rather than a victim on a daily basis.

On top of this community involvement, Pat has built a successful financial services practice, consistently qualifying for company and industry recognition over the past 18 years based around these lessons and values.

FOUNDERS' BASIC SCIENCE LECTURE

This lecture was established by a founding member (Robert Volz, President 1971 & 1972) of the Western Trauma to enhance the academic mission and provide valuable basic science information that is relevant to the field of trauma. It is a scheduled part of the annual meeting in which an invited speaker is chosen to discuss a specific basic research topic that has clinical relevance to the care of the trauma patient. Honoraria and expenses are paid by the Western Trauma Foundation as part of its mission to support the academic endeavors of the Western Trauma Association. These surgeon/researchers are selected by the program committee for their specific expertise and contributions to the knowledgebase in the field of trauma. This lecture is often a combination of translational as well as basic science research.

Presenter	Year	Location
Raul Coimbra, MD	2009	Crested Butte
Lawrence Diebel, MD	2010	Telluride
Carl J. Hauser, MD	2011	Big Sky
Fred Moore, MD	2012	Vail
Steve Shackford, MD	2013	Snowmass
Hasan B. Alam, MD	2014	Steamboat Springs
Charles S. Cox, Jr. MD	2015	Telluride
Rosemary Kozar, MD	2016	Squaw Valley
Mitchell J. Cohen, MD	2017	Snowbird
Ernest "Gene" Moore, MD	2018	Whistler
Timothy R. Billiar, MD	2019	Snowmass
Martin A. Schreiber, MD	2020	Sun Valley

FOUNDERS' BASIC SCIENCE LECTURE

BURNS ARE MORE THAN SKIN DEEP: SYSTEMIC INFLAMMATION AFTER INJURY IN THE AGED INVOLVES THE GUT-LUNG AXIS

Wednesday, February 23
8:20 am – 9:00 am

Elizabeth J. Kovacs, PhD
Director, Burn Research
Director, Alcohol Research Program
Professor, Department of Surgery, Gites
University of Colorado Denver / Anschutz
Medical Campus

Elizabeth J. Kovacs received her PhD in Cell Biology from the University of Vermont in 1984. After postdoctoral training at the National Institutes of Health (NIH) in the Biological Response Modifiers Program, she joined the faculty of the Department of Cell Biology, Neurobiology and Anatomy at Loyola University Chicago in 1987. At Loyola, Dr. Kovacs moved through the ranks to full professor and joined the Department of Surgery as Vice-Chair of Research. She was the Director of the Alcohol Research Program and the Burn and Shock Trauma Institute before relocating her laboratory to the University of Colorado Denver Anschutz Medical Campus in 2016. Dr. Kovacs was the President of the Society for Leukocyte Biology and the Shock Society and served as the Chair of the Committee on Public Affairs for the American Association of Immunologists. She is currently the Shock representative to the FASEB Board of Directors. Research in the Kovacs laboratory centers on innate immunity and inflammation in the context of burn trauma. While the lung remains Dr. Kovacs' favorite inflatable organ, her lab has also worked extensively on the skin, gut, liver, and brain. Much of this work includes "second hits," such as alcohol intoxication and infection, along with advanced age. Dr. Kovacs has been funded by NIH for >20

FOUNDERS' BASIC SCIENCE LECTURE

years and she serves/served on numerous NIH grant review panels and journal editorial boards. Her lab has published >260 papers and she is international recognized for her work in alcohol & immunity and aging & inflammation. In spite of these feats, Dr. Kovacs believes that her greatest accomplishment is her daughter, Cathy Kelley, and after that being responsible for the training of >125 individuals ranging from high school students to visiting professors and mentoring countless junior faculty across the country.

NOTES

SUNDAY, FEBRUARY 20, 2022

5:00pm - 7:00pm	**REGISTRATION OPEN** *Yellowstone Conference Center - Upper Atrium*
5:00pm - 7:00pm	**WELCOME RECEPTION** *Yellowstone Conference Center - Missouri Ballroom*
5:00pm - 7:00pm	**KIDS WELCOME RECEPTION** *Lone Peak Playhouse* *Children should wear coats, hats, gloves & boots*

MONDAY, FEBRUARY 21, 2022

6:30am - 9:00am	**REGISTRATION & EXHIBITS OPEN** *Yellowstone Conference Center*	
6:30am - 8:00am	**ATTENDEE BREAKFAST** *Yellowstone Conference Center*	
7:00am - 9:00am	**SCIENTIFIC SESSION 1** **Moderator: Robert McIntyre, MD** *Yellowstone Conference Center - Missouri Ballroom* * Indicates Earl G. Young Clinical Research Competition	
7:00am - 7:20am	1. CLOSE SURVEILLANCE IMAGING IS UNNECESSARY FOR PATIENTS WITH GRADE I BLUNT THORACIC AORTIC INJURY * *Sayuri Jinadasa MD, MPH, R Adams Cowley Shock Trauma Center, University of Maryland Medical Center, Baltimore, Maryland*	**Page 47**
7:20am - 7:40am	2. CHEST X-RAY (CXR) IS NOT A RELIABLE SCREENING TOOL FOR BLUNT THORACIC AORTIC INJURY (BTAI) - RESULTS FROM THE AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA (AAST) / AORTIC TRAUMA FOUNDATION (ATF) PROSPECTIVE BTAI REGISTRY * *Joshua Crapps MD, University of Texas at Austin Dell Medical School General Surgery Residency, Austin, Texas*	**Page 49**
7:40am - 8:00am	3. READING THE SIGNS IN PENETRATING CERVICAL VASCULAR INJURIES: ANALYSIS OF HARD/SOFT SIGNS AND INITIAL MANAGEMENT FROM A NATIONWIDE VASCULAR TRAUMA DATABASE* *Alex Marrotte MD, Naval Medical Center San Diego, Scripps Mercy Hospital San Diego, San Diego, California*	**Page 51**
8:00am - 8:20am	4. CAN WE REALLY MAKE CAUTI A NEVER EVENT? A LEVEL 1 TRAUMA CENTER'S EXPERIENCE WITH PROPHYLACTIC ANTIBIOTIC BLADDER IRRIGATION* *Rebecca Rieger MD, St. Joseph's Hospital and Medical Center, Creighton University School of Medicine Phoenix Campus, Phoenix, Arizona*	**Page 53**

8:20am - 8:40am	5. HOW TRAUMA PATIENTS DIE IN LOW RESOURCE SETTINGS: IDENTIFYING EARLY TARGETS FOR TRAUMA QUALITY IMPROVEMENT* *Sabrinah Christie MD, University of Pittsburgh Medical Center, University of California Los Angeles, University of Buea, University of Pittsburgh Medical Center, Pennsylvania*	**Page 55**
8:40am - 9:00am	6. DO NOT RESUSCITATE (DNR) STATUS AFTER INJURY: DOES RACE PLAY A ROLE?* *Sarah Cottrell-Cumber DO, University of Mississippi Medical Center, Jackson, Mississippi*	**Page 57**
7:30am - 9:00am	**FRIENDS & FAMILY BREAKFAST** *Peaks Restaurant (The Summit at Big Sky guests only)* *Huntley Dining Room (Anyone NOT staying at The Summit at Big Sky)*	
3:30pm - 6:00pm	**REGISTRATION & EXHIBITS OPEN** *Yellowstone Conference Center*	
4:00pm - 6:00pm	**SCIENTIFIC SESSION 2** **Moderator: Carlos Brown, MD** *Yellowstone Conference Center - Missouri Ballroom* * Indicates Earl G. Young Clinical Research Competition	
4:00pm - 4:20pm	7. DOES USE OF WHOLE BLOOD DURING RESUSCITATION DECREASE MORTALITY OF PATIENTS UNDERGOING TRAUMA LAPAROTOMY?* *Caitlin Burke MD, Hartford Hospital/University of Connecticut, Hartford, Connecticut*	**Page 59**
4:20pm - 4:40pm	8. CURRENT STATE OF HEMORRHAGE CONTROL AND HEMOSTATIC RESUSCITATION IN TRAUMA CENTERS ACROSS THE UNITED STATES* *Raul Reina MD, University of Arizona, Tucson, Arizona*	**Page 61**
4:40pm - 5:00pm	9. IMPAIRED POST-INJURY PLATELET AGGREGATION AND VENOUS THROMBOEMBOLISM* *Zachary Matthay MD, University of California, San Francisco, University of California, San Francisco, University of California, San Francisco*	**Page 63**

5:00pm - 5:20pm	10. WHAT HAPPENS AFTER THEY SURVIVE? THE ROLE OF ANTICOAGULANTS AND ANTIPLATELETS IN IVC INJURIES* *Allyson M. Hynes MD, University of New Mexico, Albuquerque, New Mexico*	**Page 65**
5:20pm - 5:40pm	11. RIDE SHARE TO THE RESCUE? TRENDS IN ALCOHOL-RELATED MOTOR VEHICLE COLLISIONS* *Christopher Pearcy MD, Methodist Dallas Medical Center, Dallas, Texas*	**Page 67**
5:40pm - 6:00pm	12. PROSPECTIVE EVALUATION OF CONTINUOUS INFUSION VANCOMYCIN DOSING IN THE CRITICALLY ILL TRAUMA PATIENT: THE PROVAT STUDY *Ryan Kennedy MD, University of Oklahoma, Oklahoma City, Oklahoma*	**Page 69**
6:00 pm - 7:00pm	**WTA MULTICENTER TRIALS MEETING** *Yellowstone Conference Center – Missouri Ballroom*	
6:30pm - 7:30pm	**RESIDENT RECEPTION** *Yellowstone Conference Center - Upper Atrium*	

TUESDAY, FEBRUARY 22, 2022

6:30am - 9:00am	**REGISTRATION & EXHIBITS OPEN** *Yellowstone Conference Center*	
6:30am - 8:00am	**ATTENDEE BREAKFAST** *Yellowstone Conference Center*	
7:00am - 9:00am	**SCIENTIFIC SESSION 3** **Moderator: Susan Rowell, MD** *Yellowstone Conference Center - Missouri Ballroom* ** Indicates Earl G. Young Clinical Research Competition* *** Indicates Ernest E. Moore Basic Science Research Competition*	
7:00am - 7:20am	13. PLASMA BASED ASSAYS DISTINGUISH HYPERFIBRINOLYSIS AND SHUTDOWN SUBGROUPS IN TRAUMA-INDUCED COAGULOPATHY** *Michael Lawson BA, University of Vermont, Burlington, Vermont*	**Page 71**
7:20am - 7:40am	14. ENODTHELIAL CELL DYSFUNCTION PERSISTS BEYOND RESUSCITATION IN PATIENTS WITH HEMORRHAGIC SHOCK** *Ahmad Zeineddin MD, R Adams Cowley Shock Trauma Center, University of Maryland, Baltimore, Maryland*	**Page 73**
7:40am - 8:00am	15. N-ACETYLCYSTEINE IMPROVES OUTCOMES AFTER MILD TBI IN GERIATRIC PATIENTS: A PROSPECTIVE CLINICAL TRIAL *Ryan McPherson DO, HonorHealth, Phoenix, Arizona*	**Page 75**
8:00am - 8:20am	16. TREATMENT WITH A RECOMBINANT CELL REPAIR PROTEIN ATTENUATES BRAIN LESION SIZE IN A LARGE ANIMAL MODEL OF TRAUMATIC BRAIN INJURY *Hasan Alam MD, Department of Surgery, Feinberg School of Medicine/Northwestern University, Chicago, Illinois*	**Page 77**
8:20am - 8:40am	17. HYPERTONIC SALINE INFUSION IS ASSOCIATED WITH INCREASED MORTALITY IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY *Marc Trust MD, Dell Medical School at The University of Texas Austin, Austin, Texas*	**Page 79**

TUESDAY, FEBRUARY 22, 2022

8:40am - 9:00am	18. REDUCED COMPLEMENT C4 ACTIVATION IS ASSOCIATED WITH IMPROVED OUTCOMES IN TRAUMA; POTENTIAL ROLE FOR FFP TO "BALANCE INFLAMMATION"* *Terry Schaid MD, University of Colorado Department of Surgery, Aurora, CO*	**Page 81**
7:30am - 9:00am	**FRIENDS & FAMILY BREAKFAST** *Peaks Restaurant (The Summit at Big Sky guests only)* *Huntley Dining Room (Anyone NOT staying at The Summit at Big Sky)*	
3:30pm - 6:00pm	**REGISTRATION & EXHIBITS OPEN** *Yellowstone Conference Center*	
4:00pm - 6:00pm	**SCIENTIFIC SESSION 4** **Moderator: Nicholas Namias, MD** *Yellowstone Conference Center - Missouri Ballroom*	
4:00pm - 4:15pm	19. CONSENTING FOR HIMSELF: AN UNUSUAL CASE OF DONATION AFTER CARDIAC DEATH (DCD) IN A FULLY AWAKE, ACUTELY INJURED PATIENT. *Ronald Barbosa MD, Legacy Emanuel Medical Center, PORTLAND, Oregon*	**Page 83**
4:15pm - 4:35pm	20. ACHIEVING ZERO WASTED ORGANS FOR TRANSPLANTATION IN TRAUMA PATIENTS WITH NON-SURVIVABLE HEAD INJURIES: A COLLABORATIVE MISSION BETWEEN TRAUMA AND TRANSPLANT SURGERY OR AN ETHICAL AND LOGISTIC QUAGMIRE NOT WORTH APPROACHING *Hunter Moore MD PhD, Colorado Center for Transplant Care, Aurora, Colorado*	**Page 85**
4:35pm - 4:50pm	21. REPAIR OF TRAUMATIC LUNG HERNIATION AFTER BEAR ATTACK: A CASE REPORT *Morgan Evans MD, University of New Mexico Health Sciences, Albuquerque, New Mexico*	**Page 87**
4:50pm - 5:00pm	22. IT'S TIME TO BUY A BIGGER BOAT! (*Family Presentation) *Ajai Malhotra MD, WTA Family, Burlington, Vermont*	**Page 89**

5:00pm - 6:00pm	**PRESIDENTIAL ADDRESS SPONSORED BY UCHEALTH** The VIPoma *Robert McIntyre, MD, Denver, Colorado*	**Page 91**

WEDNESDAY, FEBRUARY 23, 2022

6:30am - 9:00am	**REGISTRATION & EXHIBITS OPEN** *Yellowstone Conference Center*	
6:30am - 8:00am	**ATTENDEE BREAKFAST** *Yellowstone Conference Center*	
7:00am - 9:00am	**SCIENTIFIC SESSION 5** **Moderator: Andrew Rosenthal, MD** *Yellowstone Conference Center - Missouri Ballroom*	
7:00am - 7:20am	24. THE NEEDLE THAT JUST DOESN'T MOVE: PELVIC FRACTURE MORTALITY REMAINS HIGH DESPITE ADVANCEMENTS IN HEMORRHAGE CONTROL *Tanya Anand MD, MPH, MT (ASCP), The University of Arizona, Tucson, Arizona*	**Page 93**
7:20am - 7:40am	25. COMING IN HOT: POLICE TRANSPORT AND PRE-HOSPITAL TIME AFTER FIREARM INJURY *Eric Winter BS, University of Pennsylvania, Philadelphia, Pennsylvania*	**Page 95**
7:40am - 8:00am	26. THE SILENT KILLER: PREVIOUSLY UNDETECTED PULMONARY EMBOLISM THAT RESULT IN DEATH AFTER DISCHARGE *Kyle Kalkwarf MD, University of Arkansas for Medical Sciences, Little Rock, Arkansas*	**Page 97**
8:00am - 8:20am	27. A MULTICENTER TRIAL OF MANAGEMENT AND OUTCOMES OF PANCREATIC INJURIES: MECHANISM MATTERS *Walter Biffl MD, Scripps Memorial Hospital La Jolla, La Jolla, California*	**Page 99**
8:20am - 9:00am	**BASIC SCIENCE LECTURE** BURNS ARE MORE THAN SKIN DEEP: SYSTEMIC INFLAMMATION AFTER INJURY IN THE AGED INVOLVES THE GUT-LUNG AXIS *Elizabeth J. Kovacs, PhD*	**Page 101**
7:30am - 9:00am	**FRIENDS & FAMILY BREAKFAST** *Peaks Restaurant (The Summit at Big Sky guests only)* *Huntley Dining Room (Anyone NOT staying at The Summit at Big Sky)*	

10:00am – 1:00pm	**WTA GATES OF GLORY & NASTAR RACE (PRE-REGISTRATION REQUIRED)** *Chet's Knob Mountain*	
11:30am - 1:30pm	**MOUNTAIN PICNIC** *Huntley Dining Room*	
3:30pm - 6:00pm	**REGISTRATION & EXHIBITS OPEN** *Yellowstone Conference Center*	
4:00pm - 6:00pm	**WTA BOOK CLUB** *MILKMAN by Anna Burns* *Yellowstone Conference Center - Lamar/Gibbon Room*	
4:00pm - 6:00pm	**SCIENTIFIC SESSION 6** **Moderator: Robert McIntyre, MD** *Yellowstone Conference Center - Missouri Ballroom*	
4:00pm - 4:20pm	**ALGORITHM: BLUNT THORACIC AORTIC INJURY** *Carlos Brown MD, University of Texas at Austin, Austin, Texas*	**Page 103**
4:20pm - 5:00pm	**PANEL OF EXPERTS** A PANEL OF EXPERTS IN HOSPITAL-BASED VIOLENCE INTERVENTION: FROM THE LENS OF THE LIVED EXPERIENCE *Moderator: Rochelle Dicker, MD* *Panelists: DeAngelo Mack and Nate Snyder*	**Page 105**
5:00pm - 6:00pm	**WTA BUSINESS MEETING** *Members only *Yellowstone Conference Center – Missouri Ballroom*	**Page 107**
6:30pm - 8:00pm	**WTA FAMILY NIGHT** *Huntley Dining Room* *6:30 – 7:00pm—Ski Patrol Dog Demo – Group #1* *7:00 – 7:30pm—Enchanted Forest – Group #1* *7:00 – 7:30pm—Ski Patrol Dog Demo – Group #2* *7:30 – 8:00pm—Enchanted Forest – Group #2* **This is an outdoor event. Dress accordingly.* *Meet in Huntley Dining Room*	

THURSDAY, FEBRUARY 24, 2022

6:30am - 9:00am	**REGISTRATION OPEN** *Yellowstone Conference Center*	
6:30am - 8:00am	**ATTENDEE BREAKFAST** *Yellowstone Conference Center*	
7:00am - 9:00am	**SCIENTIFIC SESSION 7** **Moderator: S. Rob Todd, MD** *Yellowstone Conference Center - Missouri Ballroom*	
7:00am - 7:20am	32. WEIGHT-BASED ENOXAPARIN THROMBOPROPHYLAXIS IN YOUNG TRAUMA PATIENTS: ANALYSIS FO THE CLOTT-1 REGISTSRY *Sarah Lombardo MD, CLOTT-1, Salt Lake City, Utah*	**Page 109**
7:20am - 7:50am	**PRO/CON DEBATE** THE DAY OF THE PART TIME VASCULAR SURGEON IS DONE *Megan Brenner MD and Andrew Rosenthal MD*	**Page 111**
7:50am - 8:10am	34. PREDICTORS OF INITIAL MANAGEMENT FAILURE IN TRAUMATIC HEMOTHORAX: A PROSPECTIVE MULTICENTER ANALYSIS *Carl Beyer MD, University of Pennsylvania, Philadelphia, Pennsylvania*	**Page 113**
8:10am - 8:40am	**PRO/CON DEBATE** TRAUMA CENTERS SHOULD BE STAFFED TO ELIMINATE 24 HOUR SHIFTS *Marc de Moya MD and Eugene Moore MD*	**Page 115**
8:40am - 9:00am	36. POST-MORTEM COMPUTED TOMOGRAPHY SCANS (PMCTS) IMPROVE THE ACCURACY OF INJURY SEVERITY SCORES FOR TRAUMA PATIENTS WHO DIE IN THE EMERGENCY DEPARTMENT *Tanya Rinderknecht MD, University of California, Davis, Sacramento, California*	**Page 117**

7:30am - 9:00am	**FRIENDS & FAMILY BREAKFAST** *Peaks Restaurant (The Summit at Big Sky guests only)* *Huntley Dining Room (Anyone NOT staying at The Summit at Big Sky)*	
3:30pm - 6:00pm	**REGISTRATION OPEN** *Yellowstone Conference Center*	
4:00pm - 6:00pm	**SCIENTIFIC SESSION 8** **Moderator: Marc de Moya, MD** *Yellowstone Conference Center - Missouri Ballroom*	
4:00pm - 4:20pm	37. MORTALITY TIMELINE BENCHMARKS FOR HEMORRHAGE CONTROL IN NON-COMPRESSIBLE TORSO HEMORRHAGE *Jacob Broome MS, Tulane University School of Medicine, New Orleans, Louisiana*	**Page 119**
4:20pm - 4:40pm	38. PLATELET RICH PLASMA ENHANCES RIB FRACTURE STRENGTH AND CALLUS FORMATION IN VIVO *Lillian Kang MD, Duke University, Durham, North Carolina*	**Page 121**
4:40pm - 5:00pm	**ALGORITHM: BLUNT SPLENIC INJURY** *David Shatz MD, UC Davis, Sacramento, California*	**Page 123**
5:00pm - 6:00pm	**PAINT THE CEILING LECTURE** COLUMBINE: TRAGEDY TO TRIUMPH *Patrick J. Ireland*	**Page 125**
6:30pm - 10:00pm	**KIDS PARTY** *Lone Peak Playhouse* *Children should wear coats, hats, gloves & boots*	
7:00pm - 7:30pm	**RECEPTION** *Vista Hall*	
7:30pm – 9:30pm	**AWARDS BANQUET** *Vista Hall*	

FRIDAY, FEBRUARY 25, 2022

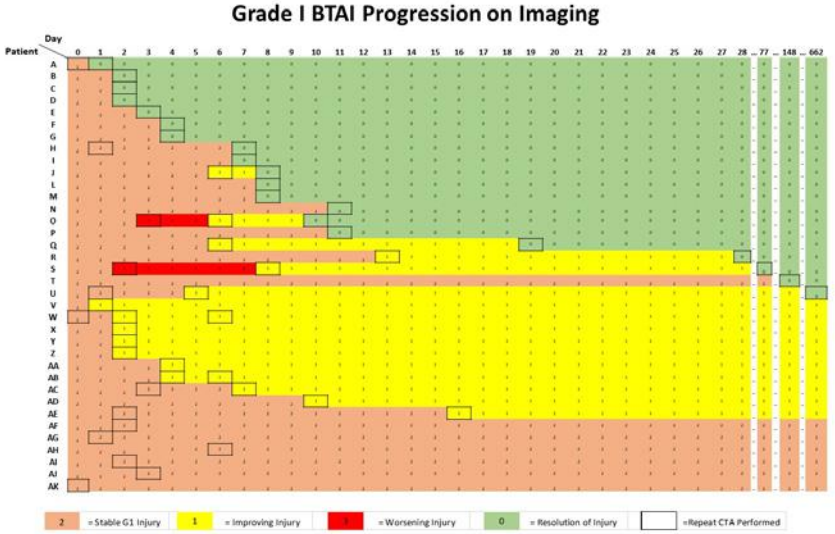
6:30am - 9:00am	**REGISTRATION OPEN** *Yellowstone Conference Center*	
6:30am - 8:00am	**ATTENDEE BREAKFAST** *Yellowstone Conference Center*	
7:00am - 9:00am	**SCIENTIFIC SESSION 9** **Moderator: Alexander Eastman, MD** *Yellowstone Conference Center - Missouri Ballroom*	
7:00am - 7:20am	41. YOU'RE NEVER TOO OLD FOR OPTIMAL VENOUS THROMBOEMBOLISM PROPHYLAXIS: RE-THINKING THE WESTERN TRAUMA ASSOCIATION GUIDELINES *Johanna Borst BS, University of California San Diego, La Jolla, California*	**Page 127**
7:20am - 7:40am	42. MANAGEMENT OF TRAUMATIC LIVER INJURIES IN HEMODYNAMICALLY STABLE PATIENTS: "DO SOMETHING" OR "WATCH AND WAIT"? *Jason Samuels MD, WTA Multicenter Trial, Aurora, Colorado*	**Page 129**
7:40am - 8:00am	43. INTEGRATING TRAFFIC SAFETY DATA WITH AREA DEPRIVATION INDEX: A METHOD TO BETTER UNDERSTAND THE CAUSES OF PEDIATRIC PEDESTRIAN VERSUS AUTOMOBILE ACCIDENTS *Victor de Cos , Rady Children's Hospital San Diego, San Diego, California*	**Page 131**
8:00am - 8:20am	44. PROSPECTIVE EVALUATION OF THE SELECTIVE NON-OPERATIVE MANAGEMENT OF ABDOMINAL STAB WOUNDS: WHEN IS IT SAFE TO DISCHARGE? *Natthida Owattanapanich MD, LAC+USC Medical Center, Los Angeles, California*	**Page 133**
8:20am - 8:40am	**ALGORITHM: BLUNT PANCREATIC INJURY** *Alexis Moren MD, Salem Health, Salem, Oregon*	**Page 135**

8:40am - 9:00am	**ALGORITHM: PEDIATRIC EMERGENCY RESUSCITATIVE THORACOTOMY** *Matthew Martin MD, Los Angeles County + USC Medical Center, Los Angeles, California*	**Page 137**
7:30am - 9:00am	**FRIENDS & FAMILY BREAKFAST** *Peaks Restaurant (The Summit at Big Sky guests only)* *Huntley Dining Room (Anyone NOT staying at The Summit at Big Sky)*	
3:30pm - 6:00pm	**REGISTRATION OPEN** *Yellowstone Conference Center*	
4:00pm - 6:00pm	**SCIENTIFIC SESSION 10** **Moderator: Nicholas Namias, MD** *Yellowstone Conference Center - Missouri Ballroom*	
4:00pm - 4:20pm	47. THE EFFECT OF THE BELMONT INFUSER ON WHOLE BLOOD COAGULABILITY *Tatiana Hoyos-Gomez MD, Oregon Health & Science University, Portland, OR*	**Page 139**
4:20pm - 4:40pm	48. FIBRINOLYTIC SHUTDOWN IS AN EARLY PREDICTOR OF POST-TRAUMATIC VTE: A PROSPECTIVE MULTICENTER STUDY FROM THE CLOTT RESEARCH GROUP *M. Margaret Knudson MD, UCSF, University of California, San Francisco, University of California, San Francisco, CA*	**Page 141**
4:40pm - 5:00pm	49. MISSED BCVI USING CURRENT SCREENING CRITERIA - THE TIME FOR LIBERALIZED SCREENING IS NOW *Julia Schmidt BA, UCHN Medical Center of the Rockies, Regional One Memphis, UCHS Memorial Hospital, Loveland, Colorado*	**Page 143**
5:00pm - 5:20pm	50. WHEN PUBLIC-HEALTH CRISES COLLIDE: A MULTICENTER EXAMINATION OF PANDEMIC EFFECTS ON PEDIATRIC FIREARM-RELATED INJURIES *Leah Tatebe MD, Cook County Health, University of Chicago, Mount Sinai Hospital, Chicago, Illinois*	**Page 145**

FRIDAY, FEBRUARY 25, 2022

5:20pm - 5:40pm	51. ACCESSIBILITY LEVEL III TRAUMA CENTERS FOR RURAL COMMUNITIES *Molly Jarman PhD, MPH, Brigham & Women's Hospital, Boston, MA*	**Page 147**
5:40pm - 6:00pm	52. THE BURDEN OF GERIATRIC TRAUMATIC BRAIN INJURY WITHIN ORGANIZED TRAUMA SYSTEMS: DEMOGRAPHICS, CARE LOCATION, DIAGNOSES, AND CMS PAYMENTS IN 348,800 MEDICARE INPATIENT CLAIMS *Samir M. Fakhry MD, Center for Trauma and Acute Care Surgery Research / HCA Healthcare, Nashville, TN*	**Page 149**

NOTES


Grade I BTAI Progression on Imaging
Day
Patient
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 ... 77 ... 148 ... 662
A B C D E F G H I J L M N O P Q R S T U V W X Y Z AA AB AC AD AE AF AG AH AI AJ AK
2 = Stable G1 Injury
1 = Improving Injury
= Worsening Injury
0 = Resolution of Injury
=Repeat CTA Performed

NOTES

Presentation # 1
Monday, 2/21/2022, 7:00am - 7:20am

CLOSE SURVEILLANCE IMAGING IS UNNECESSARY FOR PATIENTS WITH GRADE I BLUNT THORACIC AORTIC INJURY

S JINADASA, A MUELLER, C HENDRIX, C SADLER, J DUBOSE, T SCALEA, J MORRISON, R KUNDI
R Adams Cowley Shock Trauma Center, University of Maryland Medical Center, Baltimore, Maryland

Presenter: Sayuri Jinadasa
Senior Sponsor: Thomas Scalea

INTRODUCTION: Treatment of low-grade blunt thoracic aortic injury (BTAI) is not defined. Blood pressure and heart rate control and aspirin are recommended but treatment duration and when to repeat imaging is unknown. We aim to determine the natural history of low grade BTAI to determine how often and for how long patients would require treatment and repeat imaging.

METHODS: Data was retrospectively collected on patients that presented to our level one trauma center from 2013 to 2020 with grade I and II (GI, GII) BTAI. Chest CTA obtained at the time of presentation and any time after were assessed for initial injury grade and subsequent stability, improvement, worsening, or resolution. Treatments with blood pressure or heart rate control and anti-thrombotic medication were recorded.

RESULTS: 45 patients had G1 BTAI. Only 4 patients had GII injury and thus were not analyzed. The majority of patients with GI injury were male (77.7%), white (60%), injured via MVC (57.8%), and median age was 40 (IQR 30.5 – 50.5). Blood pressure and heart rate control was instituted in 37.8% and 20% of patients, respectively, while 35.6% received aspirin. 80% underwent repeat imaging and this data is summarized in Figure 1. Latest follow up imaging occurred at a median of 5 days (IQR 2-10). 83.3% of injuries improved, with 55.6% resolving completely.

CONCLUSIONS: Of the patients with G1 BTAI that were followed to improvement or resolution, 93.3% achieved this by day 14. This suggests that a single follow up scan at 2 weeks is sufficient for surveillance of G1 BTAI.

Table 1. CXR Findings in CTA Confirmed BTAI, Results from AAST / ATF Prospective BTAI Registry

	All injuries (N = 708)	SVS Grade 1 (N = 192)	SVS Grade 2 (N = 90)	SVS Grade 3 (N = 348)	SVS Grade 4 (N = 78)
Any classic CXR finding, % (n/N)	57.6% (408/708)	39.1% (75/192)	55.6% (50/90)	65.2% (227/348)	71.8% (56/78)
Widened mediastinum, % (n/N)	27.7% (196/708)	7.8% (15/192)	23.3% (21/90)	35.3% (123/348)	47.4% (37/78)
Left hemothorax, % (n/N)	12.4% (88/708)	2.6% (5/192)	14.4% (13/90)	14.7% (51/348)	24.4% (19/78)
Clavicular fracture, % (n/N)	7.3% (52/708)	5.2% (10/192)	6.7% (6/90)	8.9% (31/348)	6.4% (5/78)
Sternal fracture, % (n/N)	2.3% (16/708)	2.1% (4/192)	1.1% (1/90)	2.0% (7/348)	5.1% (4/78)
Multiple left-sided rib fractures, % (n/N)	35.2% (249/708)	31/8% (61/192)	32.2% (29/90)	38.2% (133/348)	33.3% (26/78)
Apical cap, % (n/N)	1.4% (10/708)	0% (0/192)	2.2% (2/90)	2.0% (1/78)	1.3% (1/78)
Scapular fracture, % (n/N)	4.5% (32/708)	6.3% (12/192)	1.1% (1/90)	4.3% (15/348)	5.1% (4/78)
Deviated trachea or NG tube, % (n/N)	3.4% (24/708)	0.5% (1/192)	1.1% (1/90)	4.9% (17/348)	6.4% (5/78)
Loss of AP window, % (n/N)	0.6% (4/708)	0.5% (1/192)	0% (0/90)	0.9% (3/348)	0% (0/78)

NOTES

Presentation # 2
Monday, 2/21/2022, 7:20am - 7:40am

CHEST X-RAY (CXR) IS NOT A RELIABLE SCREENING TOOL FOR BLUNT THORACIC AORTIC INJURY (BTAI) - RESULTS FROM THE AMERICAN ASSOCIATION FOR THE SURGERY OF TRAUMA (AAST) / AORTIC TRAUMA FOUNDATION (ATF) PROSPECTIVE BTAI REGISTRY

J CRAPPS, J EFIRD, J DUBOSE, P TEIXEIRA, B SHRESTHA, C BROWN
The University of Texas at Austin Dell Medical School, Austin, Texas

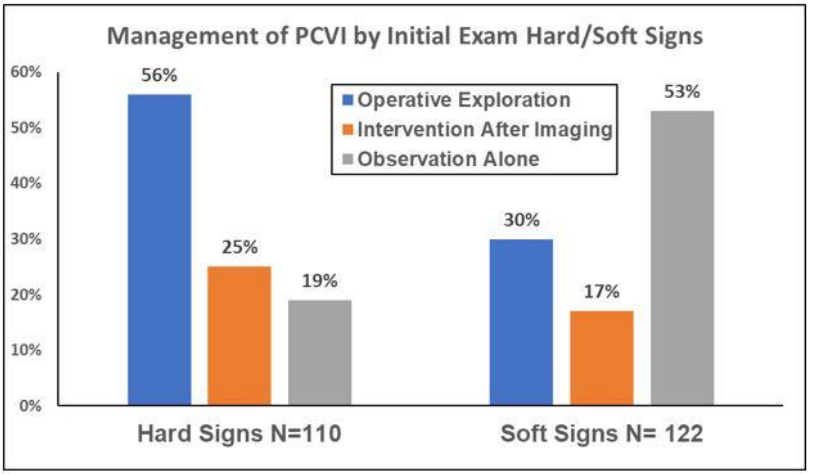
Presenter: Joshua Crapps
Senior Sponsor: Carlos V.R. Brown

INTRODUCTION: Traditional teaching continues to espouse the value of initial trauma CXR as a screening tool for blunt thoracic aortic injury (BTAI). The ability of this modality to yield findings which reliably correlate with grade of injury and need for subsequent treatment, however, requires additional multicenter prospective examination.

METHODS: The ATF / AAST prospective BTAI registry was utilized to correlate initial CXR findings to the Society for Vascular Surgery (SVS) injury grade identified on computed tomographic angiography (CTA).

RESULTS: 708 confirmed BTAI injuries with recorded CXR findings and subsequent CTA injury characterization from February 2015 to August 2021 were analyzed. The presence of any of the classic CXR findings was observed in only 57.6% (408/708) of injuries, with increasing presence correlating with advanced SVS BTAI grade (39.1% [75/192] G1; 55.6% [50/90] G2; 65.2% [227/348] G3; 71.8% [56/78] G4) [Table 1]. The most consistent single finding identified was widened mediastinum, but this was only present in 27.7% of all confirmed BTAIs and only 47.4% of G4 injuries (7.8%% G1, 23.3%, G2, 35.3% G3, 47.4% G4).

CONCLUSIONS: CXR is not a reliable screening tool for the detection of BTAI, even at the highest grades of injury. Further investigations of specific high-risk criteria for screening that incorporate imaging, mechanism and physiologic findings are warranted.


Management of PCVI by Initial Exam Hard/Soft Signs
60%
50%
40%
30%
20%
10%
0%
56%
25%
19%
30%
17%
53%
Operative Exploration
Intervention After Imaging
Observation Alone
Hard Signs N=110
Soft Signs N= 122

NOTES

Presentation # 3
Monday, 2/21/2022, 7:40am - 8:00am

READING THE SIGNS IN PENETRATING CERVICAL VASCULAR INJURIES: ANALYSIS OF HARD/SOFT SIGNS AND INITIAL MANAGEMENT FROM A NATIONWIDE VASCULAR TRAUMA DATABASE

A MARROTTE, R CALVO, J BADIEE, A ROONEY, A KRZYZANIAK, M SISE, V BANSAL, J DUBOSE, M MARTIN
Naval Medical Center San Diego, San Diego, California

Presenter: Alex Marrotte
Senior Sponsor: Matthew Martin

INTRODUCTION: Algorithms for management of penetrating cervical vascular injuries (PCVI) commonly call for immediate surgery with "hard signs" (HS) and imaging before intervention with "soft signs" (SS). We sought to analyze the association between initial exam and subsequent evaluation and management approaches.

METHODS: Analysis of PCVI from the AAST PROOVIT vascular injury registry from 25 US trauma centers. Patients were categorized by initial exam findings of HS or SS and subsequent imaging and surgical exploration/repair rates were compared.

RESULTS: Of 232 PCVI patients, 110 (47%) had HS (hemorrhage, expanding hematoma, or ischemia) and 122 (53%) had SS. With HS, 61 (56%) had immediate operative exploration and 44% underwent CT imaging (Figure). After CT, 20 (18%) required open surgical repair and 7% had endovascular intervention. Of note, 21 (19%) required no operative intervention. 122 (53%) patients had SS on initial exam; 37 (30%) had immediate surgery and 85 (70%) underwent CT imaging. After CT, 9% had endovascular repair, 7% had open surgery, and 65 (53%) were observed (Figure). No difference in mortality was observed for HS patients undergoing operative management vs observation alone (23% vs. 17%, p=0.6). Those with hemorrhage as the primary HS most often required surgery (76%), but no interventions were required in 19% of hemorrhage, 20% of ischemia, and 24% of expanding hematoma.

CONCLUSIONS: Although HS in PCVI are associated with the need for operative intervention, initial CT imaging can facilitate endovascular options or nonoperative management in a significant subgroup. HS should not be considered an absolute indication for immediate surgical exploration.

NOTES

Presentation # 4
Monday, 2/21/2022, 8:00am - 8:20am

CAN WE REALLY MAKE CAUTI A NEVER EVENT? A LEVEL 1 TRAUMA CENTER'S EXPERIENCE WITH PROPHYLACTIC ANTIBIOTIC BLADDER IRRIGATION

R RIEGER, S BONNIN, K CHAPPLE, T LOWE, D VILLA, S COATES, J BOGERT, J JACOBS, H SOE-LIN, J WEINBERG
St. Joseph's Hospital and Medical Center, Phoenix, Arizona

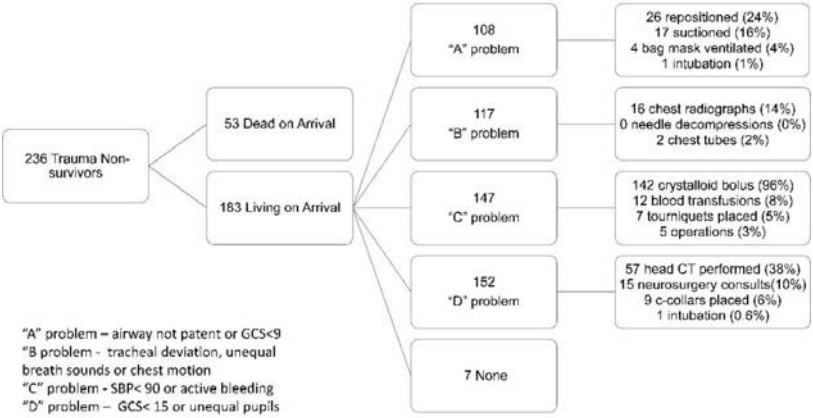
Presenter: Rebecca Rieger
Senior Sponsor: Jordan Weinberg

INTRODUCTION: Hospital-acquired catheter associated urinary tract infections (CAUTI) are considered "never events" and are reportable to CMS as a quality indicator. Despite protocols to determine appropriate removal of urinary catheters as soon as possible, severely injured trauma patients often require prolonged catheterization during ongoing resuscitation or develop retention requiring catheter replacement, exposing them to risk for CAUTI. We evaluated whether prophylactic antibiotic bladder irrigation reduces the incidence of CAUTI in critically ill trauma patients.

METHODS: Gentamicin bladder irrigation (GBI) was performed on a level 1 trauma center's patients at risk for CAUTI in 2021, defined by indwelling foley catheterization for a minimum of three days. A comparison cohort of 2020 admissions comprised the control group. CAUTI rates per 1000 catheterized days were compared between these two groups. Patients with traumatic bladder injuries were excluded

RESULTS: Our cohort included 303 patients with median hospitalization of 11 (7-18) days, ISS 17 (10-26), and days catheterized 5.2 (3.8-8.6). Eighty patients, catheterized for 652 at-risk days, received twice-daily GBI compared with 294, catheterized for 1448 at-risk days, who did not. Zero patients in the GBI group versus nine patients in the control group developed CAUTI. The incidence of CAUTI in the GBI group was significantly less than in the control group (0/1000 versus 6.2/1000 catheterized days, P=0.035).

CONCLUSIONS: Prophylactic antibiotic bladder irrigation was associated with a zero incidence of CAUTI among trauma patients at risk for CAUTI. This practice holds promise as effective infection prophylaxis for such patients. The optimal duration and frequency of irrigation remains to be determined.


236 Trauma Non-survivors
53 Dead on Arrival
183 Living on Arrival
108
"A" problem
26 repositioned (24%)
17 suctioned (16%)
4 bag mask ventilated (4%)
1 intubation (1%)
117
"B" problem
16 chest radiographs (14%)
0 needle decompressions (0%)
2 chest tubes (2%)
147
"C" problem
142 crystalloid bolus (96%)
12 blood transfusions (8%)
7 tourniquets placed (5%)
5 operations (3%)
152
"D" problem
57 head CT performed (38%)
15 neurosurgery consults(10%)
9 c-collars placed (6%)
1 intubation (0.6%)
7 None
"A" problem – airway not patent or GCS<9
"B problem - tracheal deviation, unequal breath sounds or chest motion
"C" problem - SBP< 90 or active bleeding
"D" problem – GCS< 15 or unequal pupils

NOTES

Presentation # 5
Monday, 2/21/2022, 8:20am - 8:40am

HOW TRAUMA PATIENTS DIE IN LOW RESOURCE SETTINGS: IDENTIFYING EARLY TARGETS FOR TRAUMA QUALITY IMPROVEMENT

S CHRISTIE, D ZHENG, F DISSAK-DELON, M MBIANYOR, T KINGUE, R NJOCK, D NKUSU, J TSIAGADIGUI, R DICKER, A CHICHOM-MEFIRE, C JUILLARD
University of Pittsburgh Medical Center, University of Pittsburgh Medical Center, Pennsylvania

Presenter: Sabrinah Christie
Senior Sponsor: Rochelle Dicker

INTRODUCTION: Injury deaths in sub-Saharan Africa are among the world's highest, but hospital data rarely have sufficient granularity to direct quality improvement. We analyzed clinical care patterns among trauma patients who died in a prospective, multi-center sub-Saharan cohort to pinpoint trauma quality improvement intervention targets.

METHODS: In-hospital trauma deaths in four Cameroonian hospitals between 2017 and 2019 were included. Trauma registry data on patient demographics, injury characteristics, and clinical care were analyzed to identify opportunities for systems improvements.

RESULTS: Among 9423 trauma patients, there were 236 deaths. Overall, 83% of patients who died in the emergency department were living on arrival (LOA) [Figure]. Among 183 LOA patients, 30% presented with normal vital signs, but 11% had no vital signs taken, often due to lack of equipment (43%). Of LOA patients presenting with GCS< 9 (56%), few received neurosurgery consults (15%), C-collar placement (9%) or intubation (1%). The most common reason for lack of c-collar placement was failure to recognize that it was indicated (66%). Tracheal deviation, unequal breath sounds, or paradoxical chest movement were present in 63% of LOA patients, but only 2 patients had chest tubes placed. Hypotension or active bleeding was present in 80% of LOA patients; while crystalloid bolus was given to 96% of these patients, few received transfusion (8%), tourniquet placement for extremity injury (6%) or an operation (4%).

CONCLUSIONS: Primary survey interventions are underperformed in trauma non-survivors in Cameroon. Protocolizing early treatment for head injury, hemorrhagic shock, and chest wall trauma could reduce trauma mortality.

NOTES

Presentation # 6
Monday, 2/21/2022, 8:40am - 9:00am

DO NOT RESUSCITATE (DNR) STATUS AFTER INJURY: DOES RACE PLAY A ROLE?

S COTTRELL-CUMBER, L MARTIN, M KUTCHER, C IWUCHUKWU
University of Mississippi Medical Center, Jackson, Mississippi

Presenter: Sarah Cottrell-Cumber
Senior Sponsor: Larry Martin

INTRODUCTION: Provider, patient, and family discussions of goals of care after severe injury are multifaceted, with significant regional, institutional, and personal variation in the prevalence of do-not-resuscitate (DNR) orders. Interracial differences have been previously identified in other disciplines, but have not been investigated in the trauma population. We sought to characterize the rate and timing of DNR orders for patients hospitalized due to trauma.

METHODS: We conducted a retrospective review of de-identified patient data from a single Level I trauma center between 1/2013-6/2021, including all patients admitted to the trauma surgery service with a DNR order placed during their hospitalization.

RESULTS: Of 11,003 patients admitted between 1/2013 and 6/2021, 480 (4.3%) had DNR orders placed. Although black patients made up 51.3% of the study population, they constituted only 133 (28%) of DNR orders. Black patients were more likely to be male (96 vs 205, $p=0.05$), be younger (median age 59 vs 73, $p<0.001$), and have longer lengths of stay (10 vs 6 days, $p<0.001$). Among patients with DNR orders, order placement was significantly delayed in black patients (5 vs 2 days, $p<0.001$) compared to white patients. White patients with DNR orders were also more likely be discharged alive (37.5% vs 25.5%, $p=0.013$).

CONCLUSIONS: Preliminary data demonstrate racial disparity in both frequency and timing of DNR order placement after severe injury. Multi-institutional investigation will identify barriers to optimal and timely goals of care discussion, and suggest culturally competent strategies to facilitate more effective care-focused communication.

	WB-4h (n = 836)	CT (n = 11564)	*p*
SBP <90	253 (32.1%)	2895 (26.4%)	<0.001
ISS, median (IQR)	29 (20-38)	25 (17-34)	<0.001
ISS >15	761 (91.0%)	9657 (83.5%)	< 0.001
In hospital mortality	307 (36.7%)	2630 (22.7%)	<0.001
24-hr mortality	141 (16.9%)	1115 (9.6%)	<0.001
Surgical infection[1]	69 (8.3%)	816 (7.1%)	0.194
Hospital LOS, median (IQR)	19 (11-32)	15 (9-25)	<0.001
ICU LOS, median (IQR)	8 (4-17)	5 (3-12)	<0.001

Table 1. Comparison of WB-4h and CT groups. [1]Surgical infection = SSI, deep, and organ space infections

NOTES

Presentation # 7
Monday, 2/21/2022, 4:00pm - 4:20pm

DOES USE OF WHOLE BLOOD DURING RESUSCITATION DECREASE MORTALITY OF PATIENTS UNDERGOING TRAUMA LAPAROTOMY?

C BURKE, P BROWN, J KEATING, I STAFF, S THOMPSON, J GATES, D RICAURTE
University of Connecticut/Hartford, Hartford, Connecticut

Presenter: Caitlin Burke
Senior Sponsor: Thomas Scalea

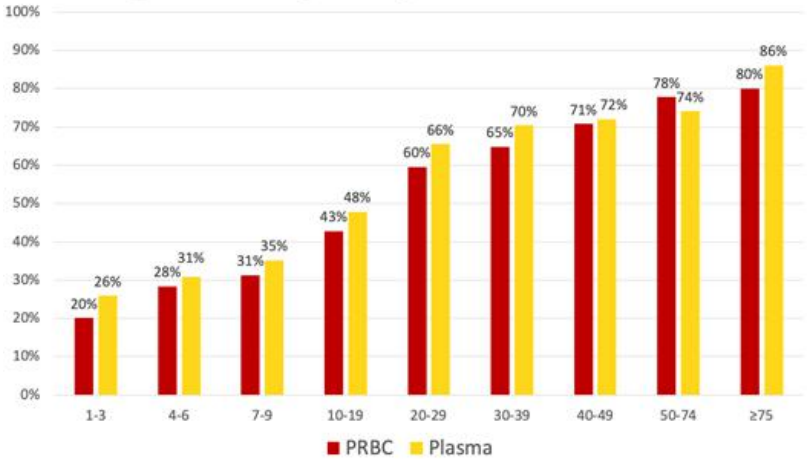
INTRODUCTION: Trauma laparotomy mortality remains high, without significant change over time. This study seeks to assess whether whole blood administration during resuscitation decreases mortality in patients undergoing laparotomy.

METHODS: A retrospective study of the ACS Trauma Quality Programs Participant Use File from 2016-2018 included patients >=18 years undergoing laparotomy. Exclusion criteria included TBI, death on arrival, and transfers from other institutions. Patients that received whole blood within 4 hours of presentation (WB-4h) were compared to those receiving component therapy (CT). Primary outcomes included in-hospital and 24-hour mortality. Secondary outcomes included surgical infection, hospital and ICU LOS.

RESULTS: 12,400 records were analyzed. Patient demographics were not significant between groups. Patients with ISS >15 were more likely to receive WB-4h than those with ISS <=15 (7.3% v 3.8%, p 15 (OR 3.4, p 65 (OR 3.8, p <0.001) and certain comorbidities to be independent predictors of mortality.

CONCLUSIONS: Whole blood administration within 4 hours of presentation is associated with higher mortality in trauma laparotomy patients despite controlling for ISS, initial blood pressure, age and comorbidities.

Figure 1: Mortality Rates by Units of PRBC and Plasma



NOTES

Presentation # 8
Monday, 2/21/2022, 4:20pm - 4:40pm

CURRENT STATE OF HEMORRHAGE CONTROL AND HEMOSTATIC RESUSCITATION IN TRAUMA CENTERS ACROSS THE UNITED STATES

R REINA, L CASTANON, O OBAID, T ANAND, A NELSON, C STEWART, M DITILLO, M DOUGLAS, L BIBLE, B JOSEPH
The University of Arizona, Tucson, Arizona

Presenter: Raul Reina
Senior Sponsor: Bellal Joseph

INTRODUCTION: Hemorrhage is the leading cause of potentially preventable deaths after trauma. Advances in hemorrhage control and hemostatic resuscitation have demonstrated merit in improving patient outcomes. The aim of this study is to describe interventions in, and outcomes of, bleeding trauma patients on a national level.

METHODS: We performed a one-year (2017) analysis of the Trauma Quality Improvement Program. We identified adult (age≥18 years) trauma patients receiving early PRBC transfusions (≤4 hours). Massive transfusion was defined as ≥4 PRBC units within 4 hours (MT-4) and ≥10 PRBC units within 24 hours (MT-24). Descriptive statistics were performed to report on hemorrhage control interventions, resuscitation requirements, and patient outcomes.

RESULTS: We identified a total of 30,463 adult trauma patients receiving early transfusions. Mean age was 44.7±19.1 years, 74.0% were male, 32.9% had penetrating injuries, and median ISS 22[13-33]. ED mortality was 8.1%, in-patient mortality 21.1%, and overall mortality 29.2%. A total of 27.1% underwent laparotomy for hemorrhage control, 9.2% angioembolization, 7.2% thoracotomy, and 1.0% REBOA, with associated mortalities of 25.0%, 21.0%, 67.5%, and 57.6%, respectively. Rates of MT-4 and MT-24 were 44.7% and 17.6%, with associated mortalities of 39.7% and 51.8%, respectively. Mortality rates by number of PRBC and plasma units transfused within 24 hours are shown in Figure.

CONCLUSIONS: Laparotomy is the most common surgical intervention for hemorrhage control. More than a quarter of trauma patients receiving transfusions died, with rates increasing to more than half in massively transfused patients. One in five patients receiving more than fifty units survive.

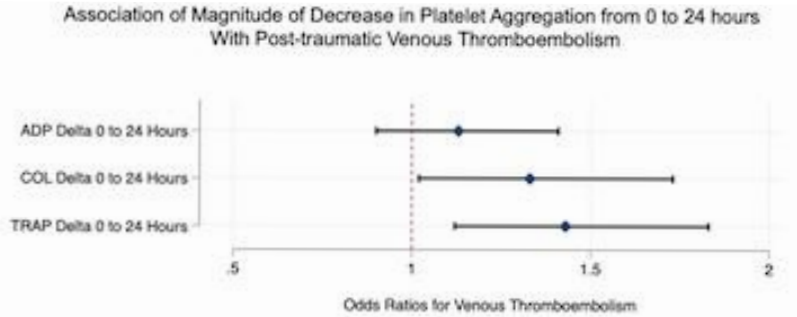


Figure. Multivariable Regression Results for Association of Ex-Vivo Platelet Aggregation with Posttraumatic Thromboembolism. Controlling for ISS, base deficit, platelet count, length of stay, and VTE prophylaxis initiation within 72 hours. Adjusted odds ratio/10 aggregation unit Delta: ADP 1.13, p=0.31; COL 1.33, p=0.04; TRAP 1.43, p<0.01)

NOTES

Presentation # 9
Monday, 2/21/2022, 4:40pm - 5:00pm

IMPAIRED POST-INJURY PLATELET AGGREGATION AND VENOUS THROMBOEMBOLISM

Z MATTHAY, Z HELLMANN, B NUNEZ-GARCIA, A FIELDS, J CUSCHIERI, M KNUDSON, M COHEN, R CALLCUT, L KORNBLITH
University of California, San Francisco, University of California, San Francisco, University of California, San Francisco

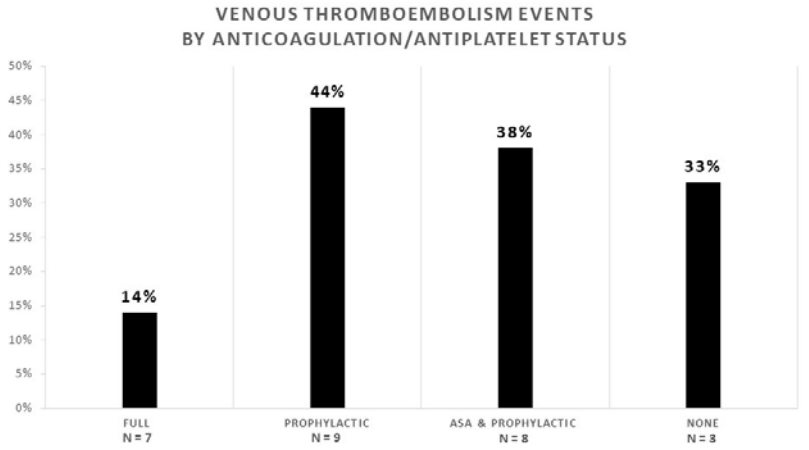
Presenter: Zachary Matthay
Senior Sponsor: M. Margaret Knudson

INTRODUCTION: Posttraumatic venous thromboembolism (VTE) remains a cause of morbidity and mortality despite widespread pharmacologic prophylaxis. Impaired ex-vivo platelet aggregation (PA) is common after injury, but the relationship with VTE is unknown. We hypothesized that early impairments in PA are associated with development of posttraumatic VTE.

METHODS: We performed secondary analyses of 126 trauma patients admitted to the ICU from a single-center prospective study of coagulation and inflammation (2011-2019). PA in response to adenosine diphosphate (ADP), collagen (COL), and thrombin (TRAP) stimulation was measured at 0h and 24h. Multivariable regression examined relationships between PA at 0h and 24h with development of VTE, adjusting for length of stay, injury severity score (ISS), base deficit, platelet count, and VTE prophylaxis initiation within 72h.

RESULTS: The 126 patients were young (median 38y), male (86%), severely injured (median ISS 26), and 17% developed VTE. Those who developed VTE had higher ISS (29 vs 24, $p<0.01$), longer length of stay (28 vs 14 days, $p<0.01$), and were less likely to receive VTE prophylaxis within 72h (18 vs 58%, $p<0.01$). Absolute values of PA at 0h and 24h were not associated with development of VTE, but the magnitude of decrease in PA (Delta) from 0h to 24h was associated with development of VTE (adjusted odds ratio/10 aggregation unit Delta: TRAP 1.43, $p<0.01$; COL 1.33, $p=0.04$, Figure).

CONCLUSIONS: Severely injured patients with decreasing ex-vivo platelet aggregation in the first 24h post-injury have an increased risk of VTE. This has implications for predicting development of VTE and for studying platelet targeted thromboprophylaxis regimens.


VENOUS THROMBOEMBOLISM EVENTS
BY ANTICOAGULATION/ANTIPLATELET STATUS
50%
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
14%
44%
38%
33%
FULL
N = 7
PROPHYLACTIC
N = 9
ASA & PROPHYLACTIC
N = 8
NONE
N = 3

NOTES

Presentation # 10
Monday, 2/21/2022, 5:00pm - 5:20pm

WHAT HAPPENS AFTER THEY SURVIVE? THE ROLE OF ANTICOAGULANTS AND ANTIPLATELETS IN IVC INJURIES

A HYNES, D SCANTLING, S MURALI, B BORMANN, J PAUL, P REILLY, M SEAMON, N MARTIN
University of New Mexico, Albuquerque, New Mexico

Presenter: Allyson M. Hynes
Senior Sponsor: Jasmeet S. Paul

INTRODUCTION: Venous thromboembolism (VTE) following IVC injury is a devastating complication. Current practice involves variable use of anticoagulation and antiplatelet agents (AC/AP). We hypothesized that postoperative AC/AP can decrease the incidence of VTE & that delayed institution of AC/AP is associated with increased VTE events.

METHODS: We retrospectively reviewed IVC injuries cared for at a large, urban, adult, academic, level 1 trauma center from 01/01/2008-12/31/2020, surviving 72-hours. Demographics, injury mechanism, repair, type and timing of AC and type and timing of VTE events was characterized. Postoperative AC status during hospital course before a VTE event was delineated by grouping patients into four AC categories: full, prophylactic, prophylactic with AP and none. Primary outcome was the incidence of an acute VTE event.

RESULTS: 27 IVC injuries were included. Incidence of a new DVT distal to the IVC injury and a new PE was 30% and 15%, respectively. All DVTs were in non-operative or in primary repair patients. Median onset of VTE was 5-days (interquartile range [IQR] 1 to 11). New VTE events occurred in 14% of full, 44% of prophylactic, 38% of prophylactic with AP & 33% of the patients without AC/AP (Fig 1). There was no difference in bleeding complications.

CONCLUSIONS: This is the first study to suggest that a delay & degree of antithrombotic initiation in an IVC injured patient may be associated with an increase in VTE events. Consideration of therapy initiation should be performed upon hemostatic stabilization. Future studies are necessary to characterize the optimal dosing/timing of these therapies.

NOTES

Presentation # 11
Monday, 2/21/2022, 5:20pm - 5:40pm

RIDE SHARE TO THE RESCUE? TRENDS IN ALCOHOL-RELATED MOTOR VEHICLE COLLISIONS

R BRADSHAW, RM KRZECZOWSKI, HM GROSSMAN VERNER, BA FIGUEROA, A KARPISEK, KJ RECORDS, MS TRUITT
Methodist Dallas Medical Center, Dallas, Texas

Presenter: Christopher Pearcy
Senior Sponsor: Michael Truitt

INTRODUCTION: The National Highway Traffic Safety Administration reports ~35 thousand motor vehicle collision (MVC) deaths annually, 30% of which are attributed to fatal alcohol-related MVCs (AR-MVCs). In 2010, Ride Share Services (RSS) were introduced with the potential to reduce the incidence of driving under the influence (DUI), thus decreasing alcohol related MVC fatalities (AR-fatalities). We hypothesized RSS would decrease DUIs, AR-MVCs, and AR-fatalities.

METHODS: Data were obtained from validated government repositories on MVCs, MVC fatalities, DUIs, AR-MVCs, AR-fatalities. AR-MVCs and AR-fatalities were reported as a percentage of total annual events. Pre- and post-RSS (2009-2019) were then compared with non-parametric assessments of variance.

RESULTS: RSS usage has increased from 5 billion rides in 2019. DUIs decreased 35% ($p=0.03$), AR-MVCs decreased 12% ($p=0.02$), and AR-fatalities decreased 12% ($p=0.02$) between pre- and post-RSS. Greatest RSS volume and 60% of AR-MVCs were observed between 12-3am. Number of male AR-MVC drivers decreased from 77% pre-RSS to 74% post-RSS ($p=0.03$). Men were self-reported as more likely to use RSS. Drivers 21-44 years accounted for the majority of RSS users and 43% of MVC fatalities.

CONCLUSIONS: Since the launch of RSS, a national decrease in DUIs, AR-MVCs, and AR-fatalities was observed. These data demonstrate a reduction in AR-fatalities among young men between 12-3am strongly correlating with RSS usage. Additional work is needed to establish causational relationships between RSS availability and AR-MVCs.

NOTES

Presentation # 12
Monday, 2/21/2022, 5:40pm - 6:00pm

PROSPECTIVE EVALUATION OF CONTINUOUS INFUSION VANCOMYCIN DOSING IN THE CRITICALLY ILL TRAUMA PATIENT: THE PROVAT STUDY

R KENNEDY, T TSUI, K STEWART, A CELII, A CROSS R VILLANEUVA
University of Oklahoma, Oklahoma City, Oklahoma

Presenter: Ryan Kennedy
Senior Sponsor: Roxie Albrecht

INTRODUCTION: Vancomycin is the first-line antibiotic for the treatment of serious gram-positive infections in critically ill trauma patients. Due to augmented renal function in trauma patients, achieving successful therapeutic levels remains challenging. Published rates of initial therapeutic vancomycin trough range between 17-33% utilizing intermittent infusions and 60% for continuous infusion. We hypothesize that our continuous vancomycin dosing protocol will achieve higher rates of initial therapeutic levels versus our previously published data.

METHODS: Prospectively-identified critically ill trauma patients admitted to a level one trauma ICU between March 2019 and August 2021, who were treated with continuous vancomycin infusion protocol with an appropriately drawn steady-state vancomycin level (i.e. 24-48h after the initiation of infusion) are reviewed. The primary outcome is the rate of initial therapeutic level defined as AUC:MIC ratio above 400mg/L.

RESULTS: 77 patients were screened, 24 patients met inclusion criteria. The median age was 34.5 years, 91.67% were male, median Injury Severity Score was 16. The overall cohort had a median CrCl of 176.4ml/min and a median ARCTIC score of 8.5. Median vancomycin loading dose of 34.4mg/kg, with median maintenance dose of 39.8mg/kg. Mean AUC:MIC ratio was 442.2, with 91.67% of patients achieving a therapeutic level. Acute kidney injury (AKI) occurred in 18.18% of patients per AKIN criteria.

CONCLUSIONS: Our continuous vancomycin protocol was able to achieve superior rate of initial therapeutic vancomycin level in critically ill trauma patients when compared with previously reported studies and our previously published data on intermittent dosing of vancomycin, despite similar rates of AKI and ARCTIC scores.

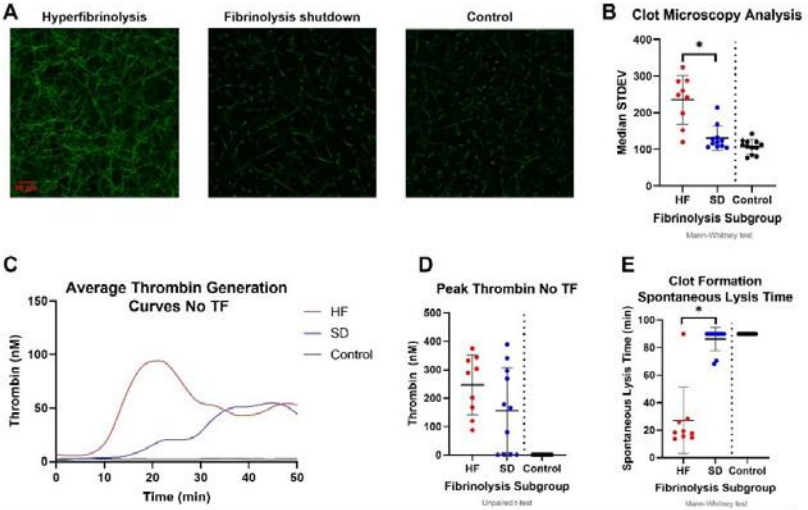


Figure. Comparison of various coagulation parameters, from plasma-based assays, between fibrinolysis subgroups. A) Representative fibrin clot structure images from each fibrinolysis subgroup. B) Variability of the fibrin clot structure determined by the standard deviation of each pixel comprising the whole clot (mean±SD). C) Average thrombin generation curves without the presence of tissue factor (TF). D) Peak thrombin generation without the presence of tissue factor (mean±SD). E) Spontaneous clot lysis time (mean±SD). Healthy controls are shown for comparison and not included in statistical analysis. $p<0.05$

NOTES

Presentation # 13
Tuesday, 2/22/2022, 7:00am - 7:20am

PLASMA BASED ASSAYS DISTINGUISH HYPERFIBRINOLYSIS AND SHUTDOWN SUBGROUPS IN TRAUMA-INDUCED COAGULOPATHY

M LAWSON, L HOLLE, N DOW, K FREEMAN, B BOUCHARD, M COHEN, H MOORE, E MOORE, A WOLBERG
University of Vermont, Burlington, Vermont

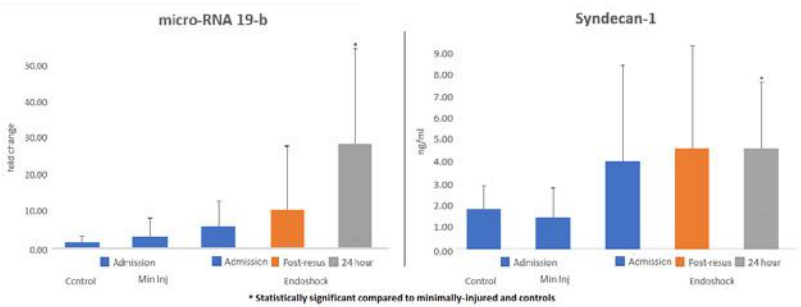
Presenter: Michael Lawson
Senior Sponsor: Mitchell Cohen

INTRODUCTION: Trauma patients with abnormal systemic fibrinolytic potential have increased morbidity and mortality. Viscoelastometry differentiates hyperfibrinolysis and fibrinolysis shutdown subgroups and can guide antifibrinolytic use. Knowledge of additional procoagulant and fibrinolytic mechanisms differentiating these phenotypes may reveal new therapeutic strategies.

METHODS: Platelet-poor plasma (PPP) from trauma patients with fibrinolysis shutdown (percent lysis at 30 minutes, LY30 3%) defined by whole blood thromboelastography were included. Non-injured control subjects provided comparison samples. Thrombin generation (TG), fibrin structure and formation, and plasmin generation were measured by calibrated automated thrombography, confocal microscopy, turbidity, and a novel calibrated plasmin assay, respectively, in the absence/presence of tissue factor (TF) or tissue plasminogen activator (tPA).

RESULTS: TG was not detected in control (non-injured) PPP whereas PPP from patients with hyperfibrinolysis or shutdown supported TG and the lag time was shorter in hyperfibrinolysis versus shutdown. Addition of TF masked this difference but revealed increased TG in hyperfibrinolysis samples. Hyperfibrinolysis PPP formed denser fibrin networks versus shutdown. In the absence of tPA, the fibrin formation rate was faster in shutdown than hyperfibrinolysis but hyperfibrinolysis clots lysed spontaneously; these differences were masked by addition of tPA. TPA-stimulated plasmin generation was similar in hyperfibrinolysis and shutdown samples.

CONCLUSIONS: PPP-based assays identify differences in TG, fibrin formation and structure, and spontaneous lysis in hyperfibrinolysis and shutdown, and suggest the presence of coagulation and fibrinolysis initiators in plasmas from these groups. The ability to characterize these activities in PPP facilitates studies to define the pathophysiology and identify mechanisms that promote poor outcomes in trauma.


micro-RNA 19-b
fold change
50.00
40.00
30.00
20.00
10.00
0.00
Admission
Admission
Post-resus
24 hour
Ccntrol
Min Inj
Endoshock
Syndecan-1
ng/ml
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Admission
Admission
Post-resus
24 hour
Control
Min Inj
Endoshock
* Statistically significant compared to minimally-injured and controls

NOTES

Presentation # 14
Tuesday, 2/22/2022, 7:20am - 7:40am

ENODTHELIAL CELL DYSFUNCTION PERSISTS BEYOND RESUSCITATION IN PATIENTS WITH HEMORRHAGIC SHOCK

A ZEINEDDIN, F WU, R VESSELINOV, A CHIPMAN, R KOZAR
R Adams Cowley Shock Trauma Center, University of Maryland, Baltimore, Maryland

Presenter: Ahmad Zeineddin
Senior Sponsor: Rosemary Kozar

INTRODUCTION: We identified a novel microRNA, miRNA-19b, that binds to and activates syndecan-1 after hemorrhagic shock (HS) and contributes to endothelial dysfunction in-vitro and in-vivo. The objective of the current study was to assess changes in miRNA-19b and syndecan-1 in HS patients over time.

METHODS: Blood was obtained from HS patients (blood pressure<90mmHg and ≥2 units blood upon arrival) upon admission, completion of hemostasis, and at 24hrs for miRNA-19b (QT-PCR) and syndecan-1 (ELISA) and compared to baseline values from healthy controls and minimally- injured (Injury severity score ISS≤9). Demographic, laboratory, and outcome data were analyzed with ANOVA, Pearson correlation, and/or logistic regression.

RESULTS: Thirty-four HS patients were studied: age 46 (19-89), 82% male, 35% penetrating, ISS 24±10, and total blood products transfused at 24 hours 21±19. MiRNA-19b was increased upon arrival and further increased over time: 5.9 -> 10.5 -> 28.7-fold change compared to 3 and 1.6 for minimally- injured patients and controls. Similarly, syndecan-1 was increased to 4 -> 4.6 -> 4.6ng/ml over time compared to 1.9 and 1.5 for minimally-injured and controls. Values for both biomarkers remained significantly increased at 24 hours compared to minimally-injured and controls. Admission syndecan-1 significantly predicted mortality, hospital length of stay, ICU days, and ventilator days.

CONCLUSIONS: We have shown for the first time that the endothelial dysfunction caused by HS, demonstrated by increased miR-19b and syndecan-1 levels, persists over time despite aggressive blood component resuscitation, suggesting these biomarkers may serve as potential small molecule pharmacological targets to mitigate the deleterious effects of endothelial dysfunction.

NOTES

Presentation # 15
Tuesday, 2/22/2022, 7:40am - 8:00am

N-ACETYLCYSTEINE IMPROVES OUTCOMES AFTER MILD TBI IN GERIATRIC PATIENTS: A PROSPECTIVE CLINICAL TRIAL

R MCPHERSON, A MANGRAM, J BARLETTA, J DZANDU
HonorHealth, Phoenix, Arizona

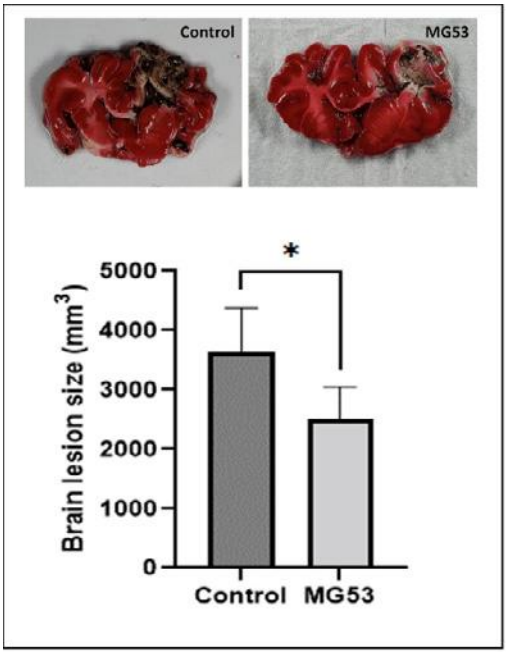
Presenter: Ryan McPherson
Senior Sponsor: Alicia Mangram

INTRODUCTION: N-acetyl cysteine (NAC) may be neuroprotective by minimizing post-concussion symptoms after mild TBI (mTB), but limited data exists. This study evaluated the effects of NAC on post-concussion symptoms in geriatric patients diagnosed with mTBI.

METHODS: This prospective, quasi-randomized, controlled trial enrolled patients age ≥60 who suffered mTBI. Patients were excluded if cognitive function could not be assessed within 3-hours post-injury. Patients were allocated to receive NAC plus standard care, or standard care alone, based on the trauma center where they presented. The primary study outcome was the severity of concussive symptoms measured using the Rivermeade Post Concussion Symptoms Questionnaire (RPQ). Symptoms were evaluated on days 0, 7, and 30. The Friedman test was used to detect within and between group (NAC treatment vs control) differences.

RESULTS: There were 65 patients analyzed (NAC, n=34; Control, n=31), average age 75±10 years. Baseline demographics and clinical variables were similar. No group differences in head Abbreviated Injury Score (AIS) or Glasgow Coma Score (GCS) were observed. Baseline RPQ scores [6.5(0-21) vs. 11(4-20), p=.402] were indistinguishable. RPQ scores on day 7 [1(0-8) vs. 10(3-18), p=.003] and 30 [0(0-4) vs. 4(0-13), p=.016] were significantly lower in the NAC group. Within group differences were significantly lower NAC (p<.001) but not control (p=.319).

CONCLUSIONS: NAC was associated with significant improvements in concussion symptoms in geriatric patients with mild TBI. These results justify further research into using NAC to treat TBI.


Control
MG53
*
Brain lesion size (mm3)
5000
4000
3000
2000
1000
0
Control
MG53

NOTES

Presentation # 16
Tuesday, 2/22/2022, 8:00am - 8:20am

TREATMENT WITH A RECOMBINANT CELL REPAIR PROTEIN ATTENUATES BRAIN LESION SIZE IN A LARGE ANIMAL MODEL OF TRAUMATIC BRAIN INJURY

G JIN, JW HO, TP KEENEY-BONTHRONE, RA OBER, B LIU, K CHTRAKLIN, Y LI, T TAN, J MA, HB ALAM
Northwestern University Feinberg School of Medicine, Chicago, Illinois

Presenter: Hasan Alam

INTRODUCTION: Background: MG53, a member of the tripartite motif (TRIM) protein family, plays an essential role in cell membrane repair and promotes cell survival. Recent studies show that systemic delivery of recombinant human MG53 (rhMG53) protein markedly attenuates tissue injury/inflammation, and facilitates healing. This study was performed to test whether intravenous (IV) administration of rhMG53 protein would decrease the lesion size in a clinically relevant large animal model of traumatic brain injury (TBI).

METHODS: Yorkshire swine (40-45 kg; n=5/group) were subjected to controlled cortical impact-TBI, and randomized to either: 1) rhMG53 protein (2 mg/kg, IV), or 2) normal saline vehicle control. Hemodynamics, intracranial pressure, and brain oxygenation were monitored for 7 hours. Brains were then harvested and sectioned into 5 mm slices and stained with 2, 3, 5 triphenyltetrazolium chloride to quantify the lesion size. Penetration/localization of rhMG53 in the brain was determined by immunohistochemistry.

RESULTS: Hemodynamic parameters were similar in both groups, but the lesion size (Figure) in the rhMG53 treated group (2517 ± 525.4 mm3) was significantly ($p < 0.05$) smaller than the control group (3646 ± 740.1 mm3). In the treated animals, rhMG53 was detected in the regions surrounding the TBI, but not in the uninjured areas; and it was absent in the control animals.

CONCLUSIONS: rhMG53 localizes to the injured areas of the brain, with the treated animals demonstrating a significant attenuation in the brain lesion size within hours following TBI.

	No HTSI (n=2,181)	HTSI (n=366)	P value
Mortality	214 (10%)	102 (28%)	**< 0.0001**
Hospital LOS	8 ± 10	16 ± 13	**< 0.0001**
ICU LOS	3 ± 6	12 ± 9	**< 0.0001**
Ventilation days	2 ± 4	7 ± 7	**< 0.0001**

Table 1. Outcomes

NOTES

Presentation # 17
Tuesday, 2/22/2022, 8:20am - 8:40am

HYPERTONIC SALINE INFUSION IS ASSOCIATED WITH INCREASED MORTALITY IN PATIENTS WITH SEVERE TRAUMATIC BRAIN INJURY

M TRUST, S ROWARD, T CARDENAS, J AYDELOTTE, P TEIXEIRA, J DUBOSE, S ALI, C NG, L BROWN, C BROWN
The University of Texas at Austin Dell Medical School, Austin, Texas

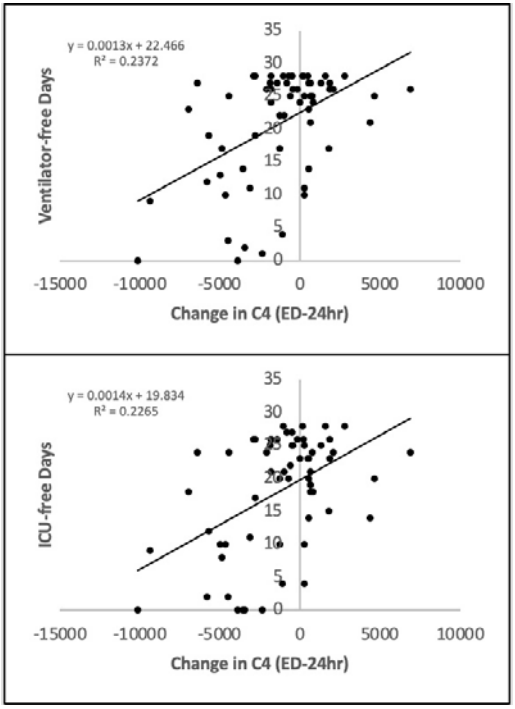
Presenter: Marc Trust
Senior Sponsor: Carlos Brown

INTRODUCTION: Despite lacking evidence to support its use, hypertonic saline infusion (HTSI) is commonly used to reduce cerebral edema in severe traumatic brain injury (TBI). The primary aim of this study was to evaluate the effect of HTSI on outcomes in this patient population. We hypothesized that HTSI would have no effect on outcomes.

METHODS: We performed a retrospective, single center study of patients admitted to our Level I trauma center from 2014 to 2020 with a TBI (Head AIS≥3). The registry was used to identify patients and abstract data. Patients who received HTSI were compared to patients who did not. Subgroup analysis was performed to evaluate outcomes throughout a spectrum of TBI severity. Primary outcome was mortality. Secondary outcomes were hospital length of stay (LOS), ventilator days and intensive care unit (ICU) LOS.

RESULTS: A total of 2,547 patients met criteria, and 366 (14%) received HTSI. On univariate analysis, patients receiving HTSI did worse in all outcomes (Table 1). After controlling for age, injury severity score, admission hypotension, Glasgow Coma Scale score, intracranial pressure monitoring, and craniotomy, HTSI was independently associated with increased mortality in all patients (OR 2.014, CI 1.36 – 2.99, p=0.0005), and subgroups of patients who received an intracranial pressure monitor and craniotomy (OR 4.13, CI 1.29-13.23, p=0.017), and patients who required neither intervention (OR 2.10, CI 1.19 – 3.69, p=0.01).

CONCLUSIONS: HTSI is independently associated with increased mortality and resource utilization in patients with severe TBI. We recommend against the routine use of HTSI in this patient population.


y = 0.0013x + 22.466
R² = 0.2372
Ventilator-free Days
35
30
25
20
15
10
5
0
-15000
-10000
-5000
0
5000
10000
Change in C4 (ED-24hr)
y = 0.0014x + 19.834
R² = 0.2265
ICU-free Days
35
30
25
20
15
10
5
0
-15000
-10000
-5000
0
5000
10000
Change in C4 (ED-24hr)

NOTES

Presentation # 18
Tuesday, 2/22/2022, 8:40am - 9:00am

REDUCED COMPLEMENT C4 ACTIVATION IS ASSOCIATED WITH IMPROVED OUTCOMES IN TRAUMA; POTENTIAL ROLE FOR FFP TO "BALANCE INFLAMMATION"

T SCHAID, M DEBOT, A CRALLEY, C ERICKSON, C SILLIMAN, E MOORE, A SAUAIA, A BANERJEE, K HANSEN, A D'ALESSANDRO, K JONES, I LACROIX, M COHEN
University of Colorado Department of Surgery, Aurora, Colorado

Presenter: Terry Schaid
Senior Sponsor: Mitchell Cohen

INTRODUCTION: Complement is activated after trauma and is associated with increased morbidity and mortality, however, specific mechanisms remain unclear. Plasma based resuscitation reduces coagulopathy and mortality, however, much of the improved outcome likely results from its inflammomodulatory effects. We sought to characterize the activation of complement after trauma and the effect of plasma (FFP) on this inflammatory response. We hypothesized that C4 is activated following trauma, associated with worse outcomes, and impacted by FFP.

METHODS: Blood was prospectively collected from injured patients at a single Level I Trauma Center. Proteomic analyses were performed through targeted liquid chromatography coupled with mass spectrometry. Concentrations of complement proteins were analyzed at multiple time points, compared between treatment groups, and correlated with outcomes.

RESULTS: Increased C4 concentrations on ED arrival were associated with lower overall mortality (0% in highest quartile of C4 level vs 19% in lowest quartile) and reduced tendency to be coagulopathic (7.5% in highest quartile vs 38% in lowest). Differences in C4 from ED to 24hr were positively correlated with ventilator-free ($r=0.49$, $P<0.001$) and ICU-free ($r=0.48$, $P<0.001$) days (Figure). At 24 hrs FFP decreased C4 concentrations ($P=0.02$) and mitigated C2 increases ($P=0.02$).

CONCLUSIONS: Higher intact C4 protein with decreased post-cleavage activation fragments is associated with improved outcomes after trauma. FFP administration significantly lowers both C4 and C2, which could imply an increase in complement activation, calling for further investigation using peptide-level proteomics to identify C4a and other cleavage peptides; however, FFP may actually restore homeostasis by facilitating a state of "balanced inflammation" in post-injury patients.

NOTES

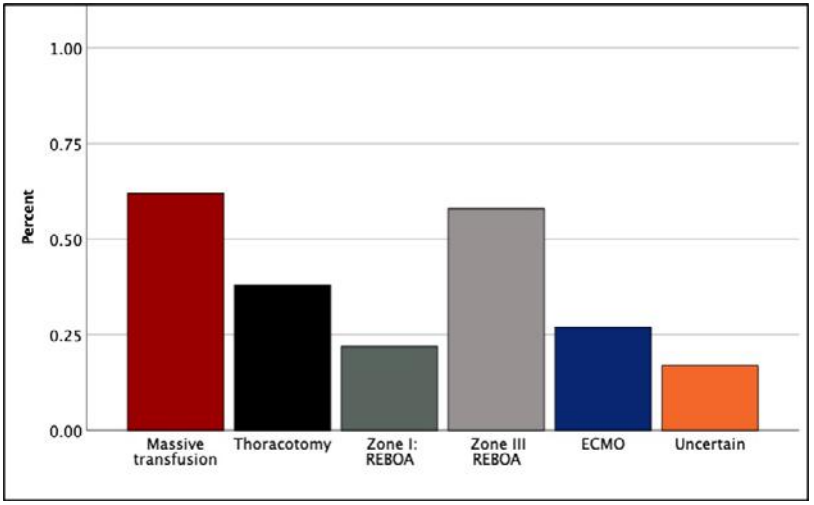
Presentation # 19
Tuesday, 2/22/2022, 4:00pm - 4:15pm

CONSENTING FOR HIMSELF: AN UNUSUAL CASE OF DONATION AFTER CARDIAC DEATH (DCD) IN A FULLY AWAKE, ACUTELY INJURED PATIENT

R BARBOSA, C ERICKSON, J STENGER ,M LUNDEBERG
Legacy Emanuel Medical Center, Portland, Oregon

Presenter: Ronald Barbosa

INTRODUCTION: He was intubated and hospital evaluation revealed a C4 fracture and severe cord contusion. Cervical spine fixation was done, followed by tracheostomy. He remained mechanically ventilated and fully conscious. Prognosis for motor recovery was deemed poor. Palliative Care was consulted. The patient and his family considered withdrawal of care. On hospital day 5, the patient began to inquire about DCD. He and his family had cared for a spinal cord injured relative previously and had discussed this situation extensively in the past. The Ethics Committee was consulted and a standard evaluation was conducted. The patient was deemed competent by a psychiatrist. Due to the unusual nature of the situation, additional input was sought from an extensive list of individuals. This included a number of senior administrators and senior legal counsel as well as other clinicians, including additional opinions from neurosurgeons and critical care physicians. Each person ultimately agreed that DCD was appropriate. The Trauma and Palliative Care services, along with the patient and family, devised a plan for rendering sedation and proceeding to the operating room. On hospital day 9, support was withdrawn and the patient expired in 17 minutes. The patient's kidneys were procured and transplanted, and the liver was procured for research use. Our case demonstrates that DCD can be conducted in awake, acutely injured patients in exceptional circumstances.


1.00
0.75
0.50
0.25
0.00
Percent
Massive transfusion
Thoracotomy
Zone I: REBOA
Zone III REBOA
ECMO
Uncertain

NOTES

Presentation # 20
Tuesday, 2/22/2022, 4:15pm - 4:35pm

ACHIEVING ZERO WASTED ORGANS FOR TRANSPLANTATION IN TRAUMA PATIENTS WITH NON-SURVIVABLE HEAD INJURIES: A COLLABORATIVE MISSION BETWEEN TRAUMA AND TRANSPLANT SURGERY OR AN ETHICAL AND LOGISTIC QUAGMIRE NOT WORTH APPROACHING

H MOORE, E MOORE, B MOORE, R MCINTYRE, T NYDAM, E POMFRET, K BEAUCHAMP
Colorado Center for Transplant Care, Aurora, Colorado

Presenter: Hunter Moore
Senior Sponsor: Robert McIntyre

INTRODUCTION: Guidance on resuscitation of trauma victims with non-survivable neurologic injuries for organ donation is lacking. These potential donors could provide a significant number of organs for transplantation. The objective of this study was to survey trauma providers on resuscitation of non-survivable neurologic injury for transplantation as an initial step towards generating guidelines on this topic.

METHODS: A survey was distributed to a regional trauma provider cohort. The questions were focused on several components of patient population, resuscitation efforts, and procurement strategy.

RESULTS: One-hundred and nineteen providers completed the survey (36% response rate). Most providers (80%) responded that driver's license consent, family approval, or any trauma patient should be resuscitated for organ procurement with non-survivable neurologic injury, with 7% uncertain, and 13% reporting no indication. Within the providers that answered they would pursue advanced resuscitative efforts; the most common modalities were massive transfusion and zone 3 REBOA (Figure). The most common answer for physicians' declaration of non-survivable injury was neurosurgeon and trauma surgeon (52%). There was no clear pattern of time limits for of resuscitation in the emergency department and ICU, and only 49% reported the operating room should be utilized.

CONCLUSIONS: The majority of trauma providers indicated that advanced resuscitation in non-survivable neurologic injury for organ donation should be performed, but the strategies for performing these efforts have a wide spectrum of answers. Ongoing discussion to generate consensus guidelines would aid in addressing this difficult clinical scenario, with the opportunity to maximize the number of lifesaving organs in the setting of futile care.

NOTES

Presentation # 21
Tuesday, 2/22/2022, 4:35pm - 4:50pm

REPAIR OF TRAUMATIC LUNG HERNIATION AFTER BEAR ATTACK: A CASE REPORT

M EVANS, R MISKIMINS
University of New Mexico Health Sciences, Albuquerque, New Mexico

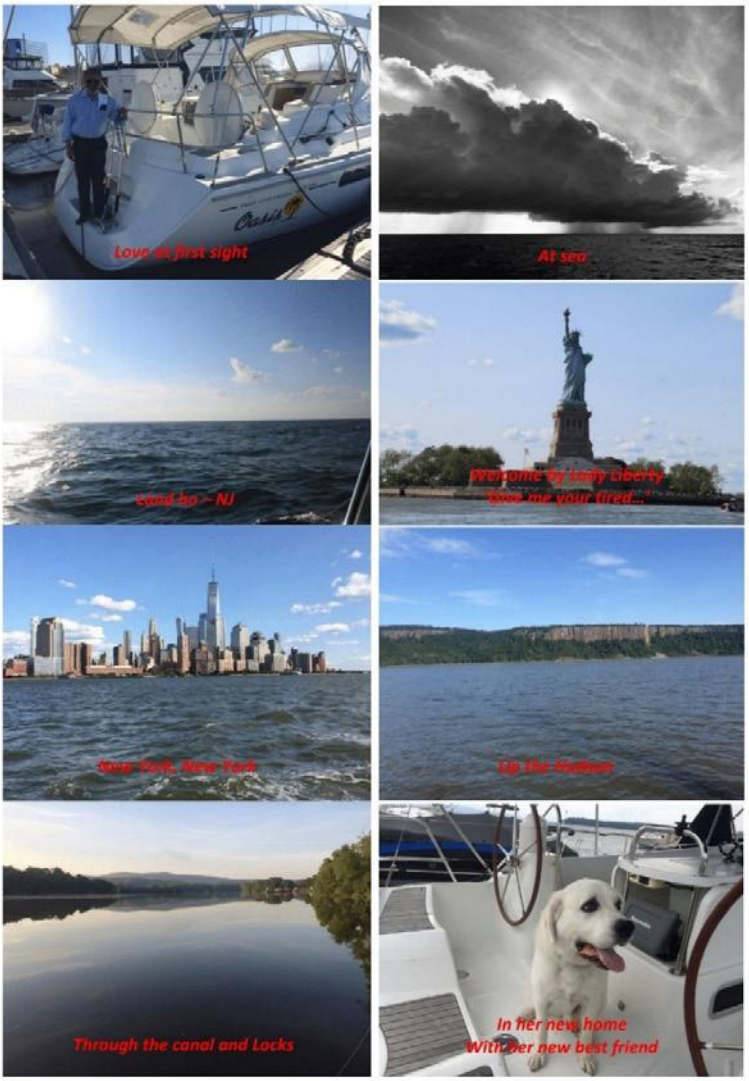
Presenter: Morgan Evans
Senior Sponsor: Jasmeet Paul

INTRODUCTION: Chest wall defects requiring complex reconstruction are well described in cases of chest wall tumor resection and are an emerging area of clinical research in trauma. We present a case of successful chest wall reconstruction after a destructive chest wall injury after a bear attack.

METHODS: A 38 year old female with no past medical history presented to a level 1 trauma center with a destructive chest wall injury after being attacked by a black bear. She was hemodynamically normal on presentation. CT of the chest demonstrated flail involving ribs 5 through 11, lung herniation, and a pulmonary laceration. On hospital day one she underwent a right thoracotomy, debridement of non-viable muscle, resection of pulmonary laceration, resection of rib 9, open reduction and internal fixation of ribs 5,6,7,8 and 10 and repair of lung hernia with porcine mesh. Absorbable antibiotic impregnated beads, chest tubes and subcutaneous closed suction drains were placed.

RESULTS: The patient was discharged on hospital day 12. The patient was followed in clinic for one year after hospital discharge. She did not have any infectious complications and has resumed her vigorous exercise routine.

CONCLUSIONS: The management of severe chest wall injuries in trauma patients is an emerging area of research. Biologic mesh and antibiotic impregnated beads can be useful adjuncts in contaminated fields.


Love at first sight
At sea
Land ho – NJ
Welcome by Lady Liberty
Give me your tired...
Up the Hudson
In her new home
With her new best friend
Through the canal and Locks

NOTES

Presentation # 22
Tuesday, 2/22/2022, 4:50pm - 5:00pm

IT'S TIME TO BUY A BIGGER BOAT!

A MALHOTRA, N MALHOTRA
University of Vermont, Burlington, Vermont

Presenter: Ajai Malhotra

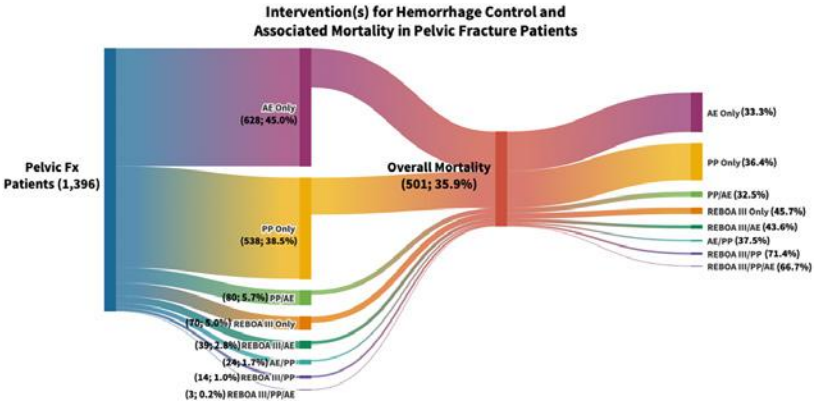
INTRODUCTION: The family – us two and our two dogs – was moving north. The boat question came up. We had a 26' sailboat that we enjoyed. Our three girls were done with college, so it was time to buy a bigger boat and we said goodbye to the 26-footer. Settled down in the north with the long cold winters and short beautiful summers, the boat issue hanging in the air. A new marina got built on the lake right in front of our house. We leased a slip that needed a boat. Found Oasis down south – it was love at first sight. After some negotiations Oasis joined the family, but she was down south and we up north, 1,100 miles separating us. Found a captain with an interesting and checkered history. Provisioned Oasis and set sail. Four days off shore, riding the Gulf stream. 'Land ho' at NJ, before reaching NYC, where Lady Liberty welcomed us – 'Give us your tired...'. Up the Hudson to Catskill where the mast came down and goodbyes were said to the captain and crew. Motored up Champlain canal through locks into the beautiful lake. She stayed there for a few nights before the final triumphant sail with family into the new marina in front of our house. In all the trip was of 14 days, including breaks. Had our share of excitement and terror, but Oasis kept us safe from the elements. Now she rests comfortably in her new home and provides the family with hours of pleasure.

NOTES

Presentation # 23
Tuesday, 2/22/2022, 5:00pm - 6:00pm

PRESIDENTIAL ADDRESS

The VIPoma
Robert McIntyre, MD, FACS
Aurora, Colorado


Intervention(s) for Hemorrhage Control and
Associated Mortality in Pelvic Fracture Patients
Pelvic Fx
Patients (1,396)
AE Only
(628; 45.0%)
PP Only
(538; 38.5%)
(80; 5.7%) PP/AE
(70; 5.0%) REBOA III Only
(39; 2.8%) REBOA III/AE
(24; 1.7%) AE/PP
(14; 1.0%) REBOA III/PP
(3; 0.2%) REBOA III/PP/AE
Overall Mortality
(501; 35.9%)
AE Only (33.3%)
PP Only (36.4%)
PP/AE (32.5%)
REBOA III Only (45.7%)
REBOA III/AE (43.6%)
AE/PP (37.5%)
REBOA III/PP (71.4%)
REBOA III/PP/AE (66.7%)

NOTES

Presentation # 24
Wednesday, 2/23/2022, 7:00am - 7:20am

THE NEEDLE THAT JUST DOESN'T MOVE: PELVIC FRACTURE MORTALITY REMAINS HIGH DESPITE ADVANCEMENTS IN HEMORRHAGE CONTROL

T ANAND, O OBAID, L CASTANON, A NELSON, M DOUGLAS, M DITILLO, L BIBLE, L GRIES, C STEWART, B JOSEPH
The University of Arizona, Tucson, Arizona

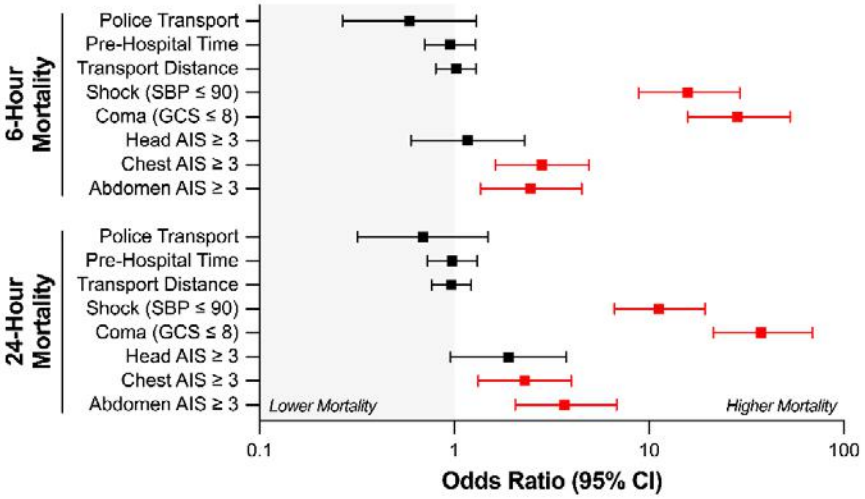
Presenter: Tanya Anand
Senior Sponsor: Bellal Joseph

INTRODUCTION: Pelvic fracture (PF) related hemorrhage remains a significant challenge in trauma. Hemostatic interventions, such as pelvic packing (PP), pelvic angioembolization (AE), and zone III resuscitative endovascular balloon occlusion of the aorta (REBOA III), are employed alone or in combination. The aim of this study is to characterize clinical outcomes based on patterns of hemorrhage control interventions in PF patients.

METHODS: An analysis of the TQIP 2017. Patients ≥18 years-old with PF massive transfusions (PRBC ≥4 units in 4hrs), and first intervention for pelvic hemorrhage control were identified. Use and order of PP, pelvic AE, and REBOA III were examined and compared against the outcomes of mortality, complications, and 24-hour transfusions.

RESULTS: A total of 1,396 PF patients with hemorrhage control interventions were identified. Mean age was 47yrs, 70% were male, and mean SBP was 71mmHg. Median ISS was 24 with an overall-mortality of 36% and a complication-rate of 41%. Pelvic AE was the most commonly used intervention (55%), followed by PP (47%) and REBOA III (9%). 89% of patients had 1 intervention, 11% had 2 interventions, and 0.2% had 3 interventions. (Figure) On multivariate analyses, only AE was associated with a mortality reduction (OR 0.624; p=0.002). Increasing number of interventions was associated with increased transfusions (β=+5.7; p<0.001), but not with mortality or complications.

CONCLUSIONS: More than one in three patients with PF-related hemorrhage die despite the advancements in hemorrhage management. The divergent pathways in types and order of treatments underscore the need for an applicable algorithm designed to standardize care and improve outcomes.


6-Hour Mortality
Police Transport
Pre-Hospital Time
Transport Distance
Shock (SBP ≤ 90)
Coma (GCS ≤ 8)
Head AIS ≥ 3
Chest AIS ≥ 3
Abdomen AIS ≥ 3
24-Hour Mortality
Police Transport
Pre-Hospital Time
Transport Distance
Shock (SBP ≤ 90)
Coma (GCS ≤ 8)
Head AIS ≥ 3
Chest AIS ≥ 3
Abdomen AIS ≥ 3
Lower Mortality
Higher Mortality
0.1
1
10
100
Odds Ratio (95% CI)

NOTES

Presentation # 25
Wednesday, 2/23/2022, 7:20am - 7:40am

COMING IN HOT: POLICE TRANSPORT AND PRE-HOSPITAL TIME AFTER FIREARM INJURY

E WINTER, J BYRNE, A HYNES, Z GENG, M SEAMON, D HOLENA, N MALHOTRA, J CANNON
University of Pennsylvania, Philadelphia, Pennsylvania

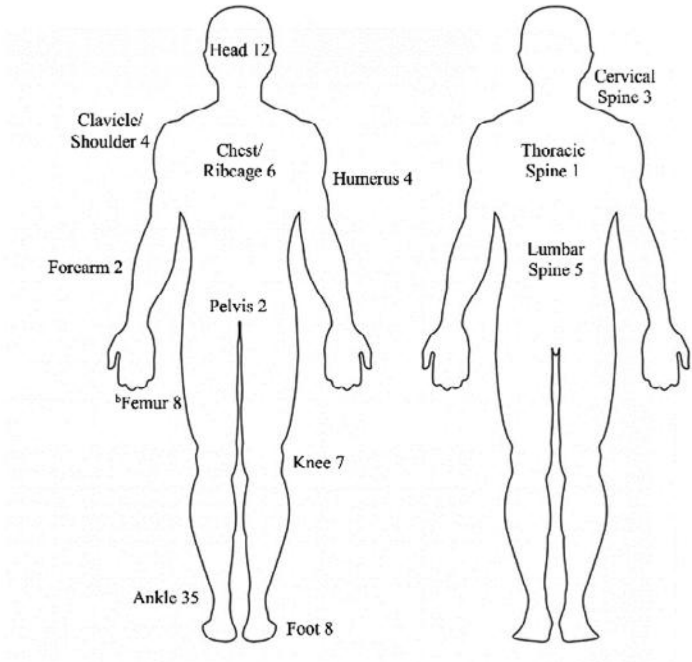
Presenter: Eric Winter
Senior Sponsor: Kenji Inaba

INTRODUCTION: In Philadelphia, PA, both police and Emergency Medical Services (EMS) transport patients with firearm injuries, but prior studies evaluating this system have lacked reliable pre-hospital times. By linking police and hospital datasets, we established a complete timeline from firearm injury to outcome. We hypothesized that police-transported patients have shorter pre-hospital times that, in turn, are associated with lower 6-hour and 24-hour mortality.

METHODS: This retrospective study linked patient-level data from OpenDataPhilly Shooting Victims and the Pennsylvania Trauma Systems Foundation. All adults with complete data transported to a Level I or II trauma center after a firearm injury in Philadelphia from 2015-2018 were included. Patient-level characteristics were compared between cohorts; unexpected survivors were identified using TRISS. Simple and multiple regression estimated associations between transport method, pre-hospital time, and outcomes.

RESULTS: Police-transported patients (n=903) had significantly shorter pre-hospital times than EMS-transported patients (n=302) (median 9 minutes [IQR 7-12] vs. 22 minutes [IQR 17-30], respectively; $p<0.001$). Police-transported patients were more often in shock or severely injured ($p=0.033$ and $p=0.015$, respectively). After adjusting for confounders, transport method and pre-hospital time were not significantly associated with 6-hour or 24-hour survival (Figure). However, police transport and pre-hospital time ≤10 minutes were associated with significantly more unexpected 6-hour survivors ($p=0.047$ and $p=0.008$, respectively).

CONCLUSIONS: Police-transported patients had more severe injuries, shorter pre-hospital times, and increased likelihood of unexpected survival compared to EMS-transported patients. After controlling for confounders, patient physiology and injury severity represent the primary determinants of mortality in our mature trauma system, indicating an ongoing need to optimize in-hospital care.



[a]The categories of injury locations are not mutually exclusive
[b]"Femur" included 5 fractures and 3 quadricep tears/rupture
Body figure available from: https://[illegible]

NOTES

Presentation # 26
Wednesday, 2/23/2022, 7:40am - 8:00am

THE SILENT KILLER: PREVIOUSLY UNDETECTED PULMONARY EMBOLISM THAT RESULT IN DEATH AFTER DISCHARGE

KJ KALKWARF, Y YANG, S MORA, DA WOLF, K STEPHENSON, JR TAYLOR III, SM CHERNEY, A BHAVARAJU, KW SEXTON, RD ROBERTSON, JB HOLCOMB, SA DRAKE
University of Arkansas for Medical Sciences, Little Rock, Arkansas

Presenter: Kyle Kalkwarf
Senior Sponsor: John Holcomb

INTRODUCTION: Pulmonary embolism (PE) is a recognized cause of death in hospitalized trauma patients. Unfortunately, less is known about PE after discharge. We reviewed all trauma patients who died of a PE after discharge to better characterize these patients.

METHODS: All post-discharge, autopsy-demonstrated, fatal PE resulting from trauma within a large US county with a very high autopsy rate from 2014-19 were analyzed. Counts, percentages, mean values with standard deviation and interquartile range were calculated for all variables.

RESULTS: Eighty-five patients died from a PE after discharge from their initial injury. The mean age was 55.4 years (SD=16.4; IQR 45.0-66.5). 53% were initially treated at non-trauma centers, 24% at level I-II trauma centers, 11% at level III-IV centers, and 7% did not seek medical assistance (6% unknown). 75% were injured by falling, and most injuries occurred in the lower extremities (56), followed by head (12), upper extremities (10), spine (9), chest (6), and pelvis (2) (not mutually exclusive). 86% had an ISS <16, but 87% needed assistance or were bed-bound after injury, despite 75% having no mobility limitations before injury. Only 11% were prescribed anticoagulation (4%) or an antiplatelet (7%) agent (14% unknown). 53% died within one month of injury and 91% within the first year. Only 8% were diagnosed with venous thromboembolism (VTE) death.

CONCLUSIONS: Fatal PE after discharge typically occurred following functionally limiting lower extremity injuries with an ISS <16. Only 11% were prescribed anticoagulation or an antiplatelet agent after injury and only 8% were diagnosed with a VTE before death.

	BLUNT PRCs	PEN PRCs	P Value
All Resection	63/148 (43%)	83/217 (38%)	0.41
HGPI Resection	52/126 (41%)	64/168 (38%)	0.58
LGPI Resection	11/22 (50%)	19/49 (39%)	0.38
All Drainage	49/246 (20%)	94/221 (43%)	<0.0001
HGPI Drainage	21/52 (40%)	25/45 (56%)	0.14
LGPI Drainage	28/194 (14%)	69/176 (39%)	<0.0001
All Nonoperative	9/211 (4%)	4/26 (15%)	0.0583
HGPI Nonoperative	4/23 (17%)	0/5 (0%)	0.76
LGPI Nonoperative	5/188 (3%)	4/21 (19%)	0.003

NOTES

Presentation # 27
Wednesday, 2/23/2022, 8:00am - 8:20am

A MULTICENTER TRIAL OF MANAGEMENT AND OUTCOMES OF PANCREATIC INJURIES: MECHANISM MATTERS

W BIFFL, C BALL, E MOORE, A GRIMES, S TODD, J WEAVER, S WYDO, A PRIVETTE, B MORSE, M MCNUTT, L DULTZ, A MEAGHER, S KOENIG, M CASTELO, K SCHAFFER, AND THE WTA MULTICENTER TRIALS GROUP ON PANCREATIC INJURIES
Scripps Clinic Medical Group, La Jolla, California

Presenter: Walter Biffl

INTRODUCTION: Injury grade is a known predictor of pancreas-related complications (PRCs) following pancreatic trauma. A recent WTA multicenter trial further highlighted the relationship between management (resection, drainage, or nonoperative) and PRCs for both low-grade (I-II,LGPI) and high-grade (III-V,HGPI) injuries. However, the impact of injury mechanism on management and outcomes has not been well studied. We hypothesized that penetrating (PEN) mechanism is a significant predictor of PRCs, independent of injury grade or management.

METHODS: Secondary analysis of a multicenter retrospective study of adult pancreatic injuries, 2010-2018. Blunt/PEN cohorts were compared primarily by two proportion z-test. Youden's index distinguished high and low volume centers for multivariate logistic regression of predictors of PRCs.

RESULTS: 33 centers reported 1240 patients (44% PEN). PEN patients had more HGPIs (50%vs35%) but lower ISS. Management varied significantly by both grade and mechanism; notably, PEN patients overall were twice as likely to undergo resection. Early and late deaths were similar between cohorts. PRCs were higher after PEN (39%vs20%,$p<0.0001$) but varied by grade and management (Table). On multivariate analysis, HGPI (OR 2.39;1.55,3.67), PEN (OR 1.99;1.31,3.05) and low volume center (<5/year- OR 1.65;1.16,2.35) were significant independent predictors of PRCs.

CONCLUSIONS: Management and outcomes of pancreatic injuries vary by mechanism. PEN mechanism is an independent risk factor for PRCs. PRCs following resection do not differ significantly by grade or mechanism, but PRCs after operative drainage are significantly higher in PEN. These findings raise caution regarding the strategy of drainage after PEN, and highlight the importance of prospective studies stratified by injury grade and mechanism.

NOTES

Presentation # 28
Wednesday, 2/23/2022, 8:20am - 9:00am

FOUNDERS BASIC SCIENCE LECTURE: BURNS ARE MORE THAN SKIN DEEP: SYSTEMIC INFLAMMATION AFTER INJURY IN THE AGED INVOLVES THE GUT-LUNG AXIS

Elizabeth J. Kovacs, PhD, University of Colorado Denver / Anschultz Medical Campus
Aurora, Colorado

WTA Algorithm for Blunt Thoracic Aortic Injury Management
High Energy Mechanism
CT Chest with IV Contrast
Normal
Continue Evaluation
Equivocal
CT Angiogram or Angiogram or TEE
BTAI
Medical Management
Nonop
Repeat Imaging
Continue Nonop
Grade I-II
Grade I-II
Grade III
Urgent Repair
Timing
TEVAR Feasible
No
Open Repair
Postoperative Management
Yes
TEVAR
Post-TEVAR Management
Grade IV
Emergent Repair
TEVAR Feasible
Yes
No
Open Repair
Postoperative Management

Presentation # 29
Wednesday, 2/24/2022, 4:00pm - 4:20pm

ALGORITHM 1 – Blunt Thoracic Aortic Injury

Presenter: Carlos Brown, University of Texas at Austin

NOTES

Presentation # 30
Wednesday, 2/23/2022, 4:20pm - 5:00pm

PANEL OF EXPERTS:
Hospital-Based Violence Intervention: From the Lens of the Lived Experience

Moderator: Rochelle Dicker, MD
Panelists: DeAngelo Mack & Nate Snyder

NOTES

Presentation # 31
Wednesday, 2/23/2022, 5:00pm - 6:00pm

WTA BUSINESS MEETING (MEMBERS ONLY)

NOTES

Presentation # 32
Thursday, 2/24/2022, 7:00am - 7:20am

WEIGHT-BASED ENOXAPARIN THROMBOPROPHYLAXIS IN YOUNG TRAUMA PATIENTS: ANALYSIS FO THE CLOTT-1 REGISTSRY

S LOMBARDO, D MILIA, L KIRALY, L KORNBLITH, M MARTIN, E HAUT, E MOORE, P KNUDSON, R NIRULA, J NUNEZ
University of Utah, Salt Lake City, Utah

Presenter: Sarah Lombardo
Senior Sponsor: Raminder Nirula

INTRODUCTION: Optimal venous thromboembolism (VTE) enoxaparin prophylaxis dosing remains elusive. Weight-based (WB) dosing safely increases antifactor-Xa levels without the need for routine monitoring but it is unclear if it leads to lower VTE risk. We hypothesized that early initiation of WB dosing would decrease VTE risk compared to standard dosing (SD).

METHODS: Patients from the CLOTT-1 registry receiving prophylactic enoxaparin (n=5371) were categorized as WB (0.45-0.55 mg/kg) or SD (30mg BID, 40mg qDay). Multivariate logistic regression was used to generate a predicted probability of VTE, deep vein thrombosis (DVT), and pulmonary embolism (PE) for WB and SD patients.

RESULTS: Of the 4911 patients, 1118 (22.8%) were WB and 3793 (77.2%) were SD. Mean age and Injury Severity Score were similar between groups but obesity was higher in the SD cohort. Unadjusted VTE rates (WB 3.0% vs. SD 3.7%), DVT (WB 2.4% vs. SD 2.8%), and PE (WB 1.0% vs. SD 1.2%) were similar. Early prophylaxis was associated with lower VTE rate (2.7% vs. 6.4%) and DVT (2.0% vs. 5.7%), but not PE. After adjustment, VTE, DVT, and PE rates did not differ by dosing strategy.

CONCLUSIONS: WB prophylaxis in young trauma patients is not associated with reduced VTE rate when compared to SD. This questions the relevance of dosing strategies that may correlate with anti-Xa levels but may not result in actual clinical reduction in VTE. Further studies need to reconcile this disconnect across a wider age and comorbidity spectrum.

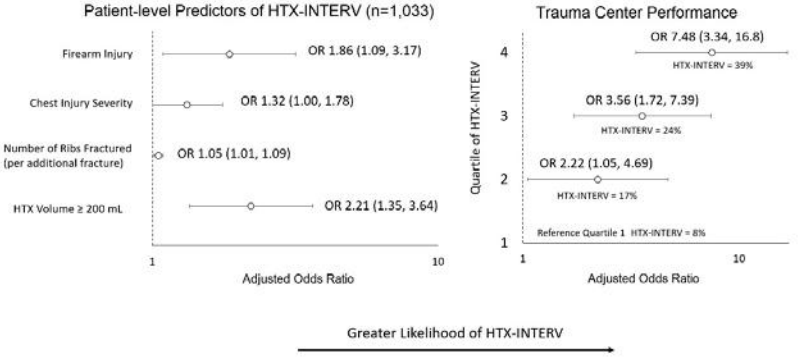
NOTES

Presentation # 33
Thursday, 2/24/2022, 7:20am - 7:50am

PRO/CON DEBATE:

THE DAY OF THE PART TIME VASCULAR SURGEON IS DONE

Megan Brenner and Andrew Rosenthal


Patient-level Predictors of HTX-INTERV (n=1,033)
Firearm Injury
OR 1.86 (1.09, 3.17)
Chest Injury Severity
OR 1.32 (1.00, 1.78)
Number of Ribs Fractured (per additional fracture)
OR 1.05 (1.01, 1.09)
HTX Volume ≥ 200 mL
OR 2.21 (1.35, 3.64)
1
10
Adjusted Odds Ratio
Trauma Center Performance
Quartile of HTX-INTERV
4
3
2
1
OR 7.48 (3.34, 16.8)
HTX-INTERV = 39%
OR 3.56 (1.72, 7.39)
HTX-INTERV = 24%
OR 2.22 (1.05, 4.69)
HTX-INTERV = 17%
Reference Quartile 1 HTX-INTERV = 8%
1
10
Adjusted Odds Ratio
Greater Likelihood of HTX-INTERV

NOTES

Presentation # 34
Thursday, 2/24/2022, 7:50am - 8:10am

PREDICTORS OF INITIAL MANAGEMENT FAILURE IN TRAUMATIC HEMOTHORAX: A PROSPECTIVE MULTICENTER ANALYSIS

C BEYER, J BYRNE, P PRAKASH, S MOORE, N MCLAUCHLAN, J REZENDE-NETO, J WARD, T SCHROEPPEL, C DODGION, K INABA, M SEAMON, J CANNON, AND THE EAST MULTICENTER HEMOTHORAX STUDY GROUP
University of Pennsylvania, Philadelphia, Pennsylvania

Presenter: Carl Beyer
Senior Sponsor: Kenji Inaba

INTRODUCTION: Traumatic hemothorax is common, and management failure leads to worse outcomes. We sought to determine predictive factors and understand the role of trauma center performance in initial hemothorax management failure.

METHODS: We prospectively examined initial hemothorax management (observation, pleural drainage, or surgery) and failure requiring subsequent intervention (HTX-INTERV) in 17 trauma centers. HTX-INTERV was at the discretion of the attending surgeon and consisted of thrombolytic administration, tube thoracostomy, image guided drainage, or surgery. Patient-level predictors of HTX-INTERV were identified for the entire cohort and two subgroups: initial observation and immediate pleural drainage. Hierarchical logistic regression quantified variation in HTX-INTERV among trauma centers.

RESULTS: Of 1,033 hemothoraces in 976 patients, 189 (18%) required HTX-INTERV. Independent predictors of HTX-INTERV included firearm injury, chest injury severity, number of ribs fractured, and hemothorax volume (Figure). HTX-INTERV occurred in 40 of 357 (11%) initially observed vs 143 of 654 (22%) with initial pleural drainage ($p<.001$). Number of ribs fractured predicted HTX-INTERV in the initial observation subgroup (OR 1.30 per fracture; 95%CI 1.09-1.56) while chest injury severity (OR 1.50; 95%CI 1.10-2.05) and hemothorax volume (OR 1.12 per 100mL; 95%CI 1.06-1.18) predicted HTX-INTERV after immediate pleural drainage. Trauma centers with higher HTX-INTERV rates managed fewer patients with hemothorax but more firearm injuries. After adjusting for patient-level factors, significant variation in trauma center performance was identified (Figure).

CONCLUSIONS: Failure of initial management of traumatic hemothorax requiring intervention is common and highly variable across trauma centers. Performance improvement will require novel approaches to managing hemothorax in high-risk patients and evaluation of center-level practices.

NOTES

Presentation # 35
Thursday, 2/24/2022, 8:10am - 8:40am

PRO/CON DEBATE:

TRAUMA CENTERS SHOULD BE STAFFED TO ELIMINATE 24 HOUR SHIFTS
Marc de Moya and Eugene Moore

NOTES

Presentation # 36
Thursday, 2/24/2022, 8:40am - 9:00am

POST-MORTEM COMPUTED TOMOGRAPHY SCANS (PMCTS) IMPROVE THE ACCURACY OF INJURY SEVERITY SCORES FOR TRAUMA PATIENTS WHO DIE IN THE EMERGENCY DEPARTMENT

T RINDERKNECHT, D SHATZ
University of California, Davis, Sacramento, California

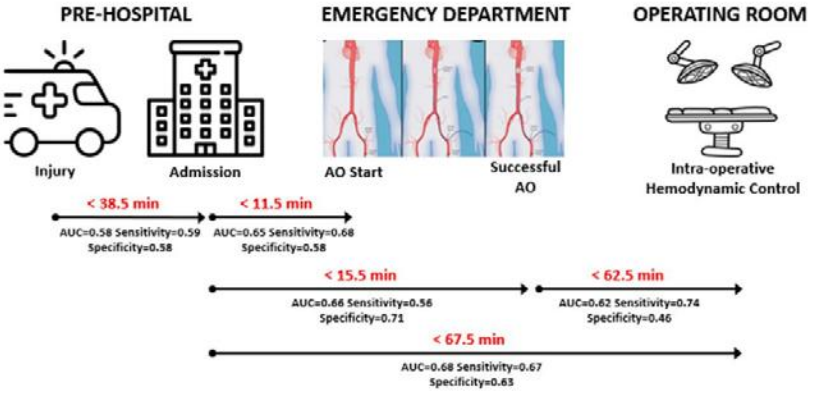
Presenter: Tanya Rinderknecht
Senior Sponsor: David Shatz

INTRODUCTION: Autopsy is the gold standard for characterizing injury burden and cause of death of trauma patients who expire in the Emergency Department (ED). Autopsy data are used to both inform clinical quality improvement efforts and generate Injury Severity Scores (ISS). Unfortunately, autopsy rates are highly variable and, in many regions, disappointingly low. We hypothesized that post-mortem computed tomography scans (PMCTs) could serve as an alternate source of similar information and thus enable more accurate ISS scoring.

METHODS: We performed a review of prospectively-collected PMCTs on trauma patients who died in the ED prior to any imaging or surgical exploration at a Level 1 trauma center between January 2020 and September 2021. PMCTs were used to generate ISS scores, which were then compared with ISS scores based on chart review. Patients with presumed medical causes of death (7) were excluded.

RESULTS: 34 patients had ISS scores generated based on both the chart and on PMCT. PMCT-based ISS scores were equal to or higher than chart-based scores in all but 1 case. Amongst the 33 patients with equal or greater PMCT scores, the mean increase in the ISS score based on PMCT was 19.7 points (range 0-58 points).

CONCLUSIONS: PMCTs can improve the accuracy of ISS calculation in trauma patients who die in the ED when compared with chart-based scores. More accurate ISS will better inform risk-adjusted mortality rates and provide trauma systems with improved data for quality improvement efforts. PMCTs could serve as an important tool, especially in regions with limited access to autopsies.


PRE-HOSPITAL
EMERGENCY DEPARTMENT
OPERATING ROOM
Injury
Admission
AO Start
Successful AO
Intra-operative Hemodynamic Control
< 38.5 min
AUC=0.58 Sensitivity=0.59 Specificity=0.58
< 11.5 min
AUC=0.65 Sensitivity=0.68 Specificity=0.58
< 15.5 min
AUC=0.66 Sensitivity=0.56 Specificity=0.71
< 62.5 min
AUC=0.62 Sensitivity=0.74 Specificity=0.46
< 67.5 min
AUC=0.68 Sensitivity=0.67 Specificity=0.63

NOTES

Presentation # 37
Thursday, 2/24/2022, 4:00pm - 4:20pm

MORTALITY TIMELINE BENCHMARKS FOR HEMORRHAGE CONTROL IN NON-COMPRESSIBLE TORSO HEMORRHAGE

J BROOME, E TORAIH, M HUSSEIN, A ALI, S TRAN, T BROWN, D TATUM, A SMITH, S TAGHAVI, R SCHROLL, J DUBOSE, J DUCHESNE
Tulane University School of Medicine, New Orleans, Louisiana

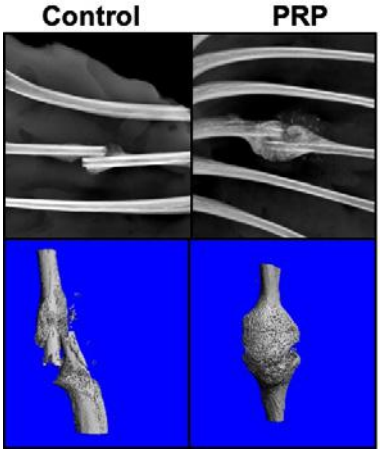
Presenter: Jacob Broome
Senior Sponsor: Rebecca Schroll

INTRODUCTION: Time is an essential element in outcomes of trauma patients. The relationship of time to treatment in management of non-compressible torso hemorrhage (NCTH) with resuscitative endovascular balloon occlusion of the aorta (REBOA) or resuscitative thoracotomy (RT) has not been previously described. The aim was to identify the threshold time intervals where mortality begins to increase.

METHODS: This review of the Aortic Occlusion for Resuscitation in Trauma and Acute Care Surgery registry included patients that underwent Emergency Department aortic occlusion (AO) with RT or REBOA and survived to admission between 2013-2020. Multivariate Cox regression and decision tree analyses were employed to examine time thresholds of mortality.

RESULTS: A total of 526 RT (54.5%) and 439 REBOA (45.5%) patients met inclusion criteria. REBOA patients were more frequently bluntly injured (84% vs 42%, $p<0.001$) but had no difference in injury severity score (34 vs 30, $p=0.36$). For all patients, time from admission to successful AO <16 mins was associated with increased mortality (Figure 1). Successful AO to intra-operative hemodynamic control (IHC) in <63 minutes and admission to IHC <68 mins were both associated with increased mortality. Similar trends were observed when REBOA and RT were examined separately.

CONCLUSIONS: This is the first mortality timeline benchmark analysis for hemorrhage control in NCTH via AO. These results suggest rapid intervention and resuscitation once at the hospital may not be sufficient to compensate for severe exsanguination and hypovolemia that has already occurred. Mobile resuscitation efforts, particularly with blood products, closer to the point of injury may improve mortality outcomes.



NOTES

Presentation # 38
Thursday, 2/23/2022, 4:20pm - 4:40pm

PLATELET RICH PLASMA ENHANCES RIB FRACTURE STRENGTH AND CALLUS FORMATION IN VIVO

L KANG, A MIRANDO, N MCMILLIAN, N BRIGHAM, A SHIROFF, S AGARWAL, M BECKER, M HILTON, J FERNANDEZ-MOURE
Duke University, Durham, North Carolina

Presenter: Lillian Kang
Senior Sponsor: David Livingston

INTRODUCTION: It is estimated that rib fractures account for ~40% of all fractures in the Unites States annually with over 350,000 patients sustaining rib injuries. Early stabilization has shown to be effective in reducing pulmonary complications. Platelet rich plasma(PRP) is a growth factor rich blood product known to improve soft tissue and boney healing. We sought to study the effects of PRP on rib fracture healing in a rat rib fracture model. We hypothesized that the addition of PRP to the fracture site would accelerate callus formation and improve ductility or resistance to fracture.

METHODS: Thirty-two lewis rats underwent fracture of the 6th rib and were treated with 100 ul PRP(1x106 plt/ul) or saline. At 2 weeks, ribs were harvested and underwent 3-point bending to quantify elastic modulus and flexural strength. To quantify callus formation X-Ray and microCT was performed and callus index measured. To quantify cellularization calluses were stained with DAPI. Callus were also stained with pico sirus red and alcian blue.

RESULTS: PRP significantly increased callus diameter(9.3mm v 4.3 mm) and callus index(4.5 v 2.1) after 2 weeks. This correlated with increased calcium deposition on micro CT. Cellularization was significantly increased in PRP-treated animals. PRP-treated ribs exhibited higher strain at failure and indicating higher ductility.

CONCLUSIONS: Accelerated fracture healing could improve clinical outcomes. PRP increased callus size and resistance to fracture at 2 weeks; findings which may lead to accelerated fracture stabilization. These findings indicated that PRP may be a useful adjunct to improve fracture healing in patients at risk of pulmonary complications.

WTA Algorithm for Blunt Splenic Injury
Blunt abdominal trauma
Hemodynamically stable?
Yes
No
FAST positive?
Yes
No
Laparotomy
Splenectomy vs. splenorrhaphy
A
Investigate for other sources of instability
B
Contrast CT shows splenic injury?
Yes
No
Continue trauma work-up
Blush?
C
Yes
No
Splenic angioembolization
D
Unsuccessful
Successful
Admit for observation or laparotomy
E
Admit for observation
E

Presentation # 39
Thursday, 2/23/2022, 4:40pm - 5:00pm

ALGORITHM 2 – Blunt Splenic Injury

Presenter: David Shatz, UC Davis

Blunt Splenic Injury Management Guideline
Nonoperative and Post-Splenic Angioembolization

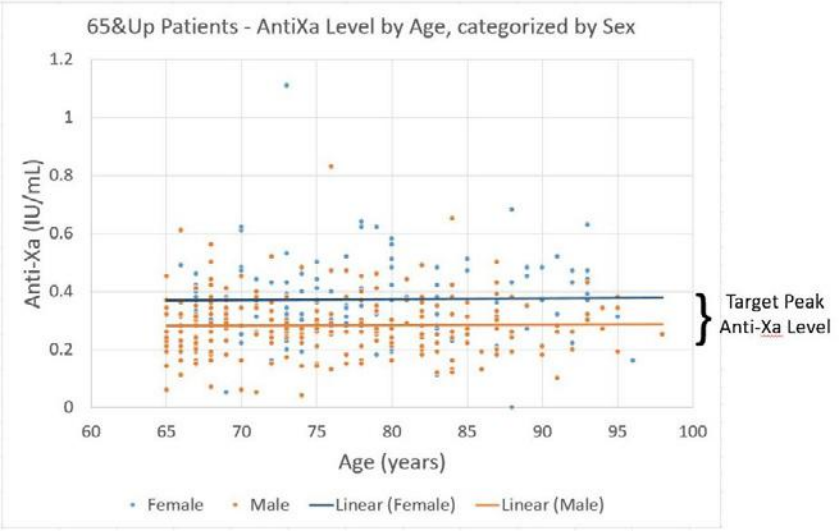
	LOW GRADE	HIGH GRADE
AAST GRADE	I & II	III, IV, V
ICU	No	Yes
Labs (CBC)	q12h until stable x2	q6h until stable x2
Monitoring	Vital signs q4h	Continuous HR with q1h BP
Diet	Clear liquid diet x12h	NPO x12h
DVT prophylaxis	Start within 24h in the absence of a major hemorrhagic component	Start within 24-48h of stable hemoglobin
Follow-up CT scan	Clinical change or decrease in Hgb only	72 hours after injury
Discharge criteria (minimum admission time)	Stable Hgb, 24h from injury and tolerating po	Stable CT, stable Hgb, and tolerating po
Return to normal activity	2 weeks (6 weeks for all sports) and strenuous activity	4 weeks (minimum 6 weeks for all sports based on clinical judgement) and strenuous activity

NOTES

Presentation # 40
Thursday, 2/24/2022, 5:00pm - 6:00pm

PAINT THE CEILING LECTURE:
COLUMBINE: TRAGEDY TO TRIUMPH

Patrick Ireland


65&Up Patients - AntiXa Level by Age, categorized by Sex
Anti-Xa (IU/mL)
1.2
1
0.8
0.6
0.4
0.2
0
60
65
70
75
80
85
90
95
100
Age (years)
Female
Male
Linear (Female)
Linear (Male)
Target Peak
Anti-Xa Level

NOTES

Presentation # 41
Friday, 2/25/2022, 7:00am - 7:20am

YOU'RE NEVER TOO OLD FOR OPTIMAL VENOUS THROMBOEMBOLISM PROPHYLAXIS: RE-THINKING THE WESTERN TRAUMA ASSOCIATION GUIDELINES

JM BORST, RN MODI, TN KIRCHBERG, K BOX, A SMITH, LN GODAT, JJ DOUCET, JE SANTORELLI, TW COSTANTINI, AE BERNDTSON
University of California San Diego School of Medicine, La Jolla, California

Presenter: Johanna Borst
Senior Sponsor: Allison Berndtson

INTRODUCTION: Enoxaparin is the standard of care for venous thromboembolism prophylaxis in trauma patients. The 2020 Western Trauma Association (WTA) guidelines recommend 40mgBID dosing for most patients; however, patients ≥65 years old (65&Up) receive 30mgBID. We hypothesized that 40mgBID dosing in 65&Up patients has a similar safety profile as in younger patients (Below65).

METHODS: We retrospectively reviewed patients admitted to a Level 1 trauma center for ≥4 days from 07/2015-04/2019 who received enoxaparin per weight-based protocol and had an appropriately timed peak anti-Xa level (goal: 0.2-0.4IU/mL). Patients with a creatinine clearance (CrCl) <30mg/dL were excluded. Patients receiving 40mgBID (60-99kg) were analyzed. Patients 65&Up were compared to Below65 to assess difference in anti-Xa levels, expansion of intracranial hemorrhage (ICH), and hemorrhagic complications.

RESULTS: 1066 patients received enoxaparin 40mgBID. 273 (25.6%) of these were 65&Up. 65&Up patients were more often female (30.8% vs. 16.9%, p<0.001), had a similar mean weight (78.1±10.8kg vs. 79.5±10.5kg, p=0.059), and lower mean CrCl (89.0±32.2 vs. 153.5±45.2mg/dL, p<0.001). Rates of in-range anti-Xa levels were similar (67.4% vs. 69.7%, p=0.472), with no difference in expansion of ICH (3.7% vs. 1.8%, p=0.243) or other hemorrhagic complications. Patients 65&Up had higher rates of supra-prophylactic anti-Xa levels (17.2% vs. 11.1%, p=0.017); however, on logistic regression, the only predictor of supra-prophylactic levels was female sex (OR 3.92 [2.19-7.03], p<0.001).

CONCLUSIONS: Enoxaparin 40mgBID has a similar safety profile in 65&Up patients as in those Below65. Dosing guidelines, including those from the WTA, should reassess patients 65&Up for inclusion in standard 40mgBID dosing protocols.

Table 1: Propensity score matching of patients treated with observation versus angiography

	Matched Cohort		
	No AE (n=45)	AE (n=45)	p-value
Age	37 [24, 53]	37 [28, 51]	0.77
Pulse	95 [82, 111]	100 [90, 114]	0.15
ISS	27 [21, 34]	26 [20, 35]	0.90
Transfusion within 4 hours	18 (40.0)	21 (46.7)	0.67
Outcomes			
Hospital length of stay	7 [4, 11]	10 [6, 27]	0.02
Mortality	3 (6.7)	2 (4.4)	>0.99
IR drain for liver-related complication	2 (4.4)	10 (22.2)	0.03

NOTES

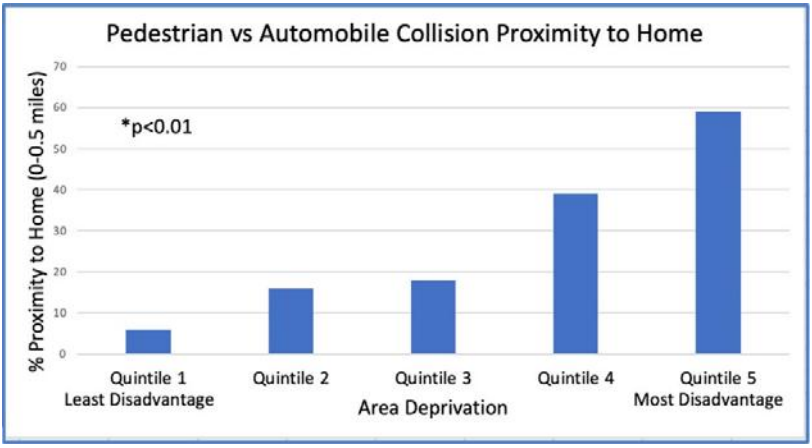
Presentation # 42
Friday, 2/25/2022, 7:20am - 7:40am

MANAGEMENT OF TRAUMATIC LIVER INJURIES IN HEMODYNAMICALLY STABLE PATIENTS: "DO SOMETHING" OR "WATCH AND WAIT"?

J SAMUELS, H CARMICHAEL, S URBAN, S BALLOW, R DIRKS, M SPALDING, A LARICCIA, M FARRELL, D STEIN, M TRUITT, H GROSSMAN-VERNER, C MENTZER, T MACK, C BALL, K MUKHERJEE, G MLADENOV, D HAASE, H ABDOU, T SCHROEPPEL, J RODRIQUEZ, J NAHMIAS, E TAY, M BALA, N KERI
University of Colorado-Anschutz, Aurora, Colorado

Presenter: Jason Samuels
Senior Sponsor: Robert McIntyre

CONCLUSIONS: The management of liver injuries in hemodynamically stable patients (HDS) is variable and includes primary treatment strategies of observation (OBS), angiography (IR) with or without angioembolization (AE), or operative intervention (OR). We aim to define the management of traumatic liver injuries with active extravasation in HDS. Our hypothesis is that OBS will be an equivalent treatment strategy to AE and have fewer complications. Prospective, multi-center, observational study. Inclusion: HDS patients with CT scan with active extravasation. Exclusion: known cirrhosis, hemodynamic instability, age <16y. The primary outcome is liver-specific complications. Secondary outcome include length of stay (LOS) and mortality. Patients definitively managed with angioembolization (AE) were compared to those treated OBS and IR without AE (OBS+/-IR). Propensity score matching (PSM) was used to match based on penetrating mechanism, liver injury severity, arrival vital signs, early transfusion. Twenty four centers enrolled 192 patients. 40% of patients (n=77) were initially OBS. 11 (14%) OBS patients failed non-operative management and went to IR or OR. 61 (32%) patients were managed with IR and 42 (69%) of these had AE. 54 patients (28%) went to OR+/-IR. Comparing AE to OBS+/-IR, PSM groups were comparable on baseline characteristics. There was no difference in mortality, AE group had longer LOS (p=0.02) and secondary drain placement for abscess or biloma (22% vs. 4%, p=0.03 (Table 1). Due to the increase rate of biloma and abscess formation in patients undergoing AE we would recommend a trial of non-operative management and avoiding empiric AE in the absence of active extravasation on angiography.


Pedestrian vs Automobile Collision Proximity to Home
% Proximity to Home (0-0.5 miles)
70
60
50
40
30
20
10
0
*p<0.01
Quintile 1
Least Disadvantage
Quintile 2
Quintile 3
Area Deprivation
Quintile 4
Quintile 5
Most Disadvantage

NOTES

Presentation # 43
Friday, 2/25/2022, 7:40am - 8:00am

INTEGRATING TRAFFIC SAFETY DATA WITH AREA DEPRIVATION INDEX: A METHOD TO BETTER UNDERSTAND THE CAUSES OF PEDIATRIC PEDESTRIAN VERSUS AUTOMOBILE ACCIDENTS

V DE COS, A ROONEY, A SYKES, C GHETTI, H THANGARAJAH, S BICKLER, V BANSAL, M MARTIN, D LAZAR, R IGNACIO
University of California San Diego School of Medicine, San Diego, California

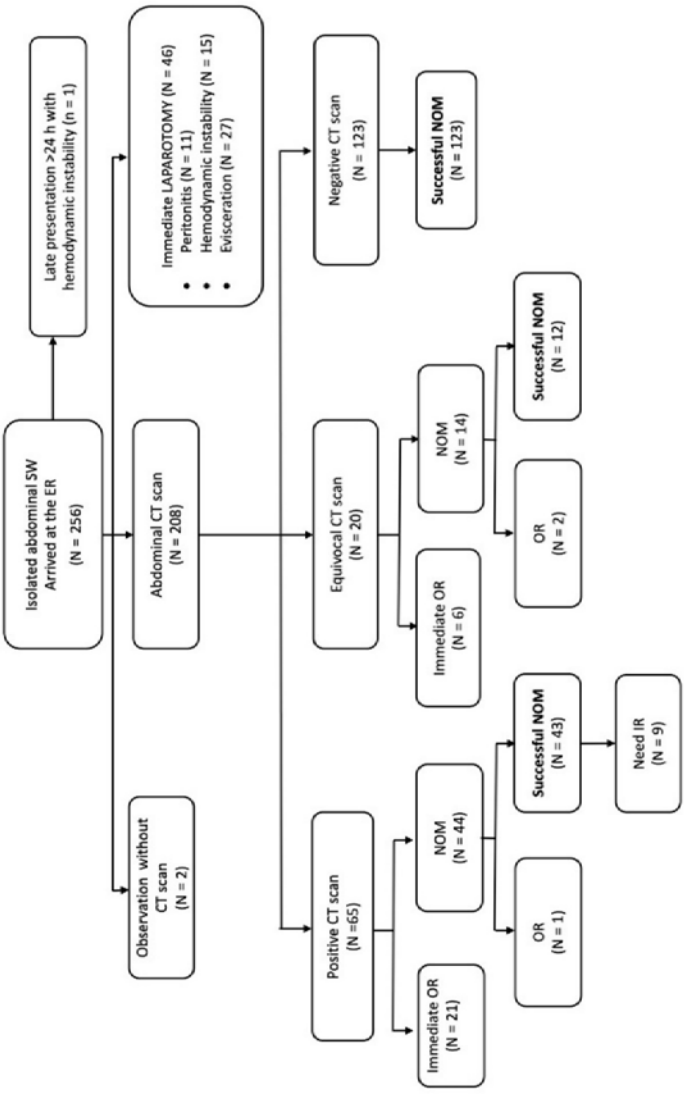
Presenter: Victor de Cos
Senior Sponsor: Matthew Martin

INTRODUCTION: The purpose of this study was to evaluate factors influencing pediatric pedestrian versus automobile collisions (PVAC) with a particular emphasis on neighborhood socioeconomic disadvantage (NSD).

METHODS: A retrospective review was performed of pediatric (≤18 years-old) PVAC treated at a Level 1 pediatric trauma center from 2008 to 2018. Demographic, clinical, and traffic scene data were analyzed. Area Deprivation Index (ADI) was used to measure NSD based on home addresses. Traffic scene data from the California Statewide Integrated Traffic Records System (SWITRS) were matched to clinical records. Traffic safety was assessed by the proximity of the collision to home addresses and sidewalk coverage.

RESULTS: Among 770 patients, the majority were male (65%), Hispanic (54%), with a median age of 8 years (IQR 4-12). Hispanic patients were more likely to live in neighborhoods with greater ADI scores (4/5) than non-Hispanic patients (67% vs. 45%, $p<0.01$). There were no differences in clinical characteristics or outcomes across ADI quintiles. Using the SWITRS (N=272), patients with higher ADI were more likely injured during dark streetlight conditions (15% vs. 4% least disadvantaged; $p=0.04$) and within 0-0.5 miles from home (Figure; $p<0.01$). Pedestrian violations were common (65%). During after-school hours, 25% were pedestrian violations compared to 12% driver violations ($p=0.02$). There were no differences in road conditions and sidewalk coverage.

CONCLUSIONS: A larger proportion of Hispanic children injured in PVAC lived in neighborhoods with greater socioeconomic disadvantage. Collision proximity to home and poor streetlight conditions were associated with greater NSD. This research may support targeted prevention programs to improve pedestrian safety.


Isolated abdominal SW
Arrived at the ER
(N = 256)
Late presentation >24 h with
hemodynamic instability (n = 1)
Observation without
CT scan
(N = 2)
Abdominal CT scan
(N = 208)
Immediate LAPAROTOMY (N = 46)
Peritonitis (N = 11)
Hemodynamic instability (N = 15)
Evisceration (N = 27)
Positive CT scan
(N =65)
Equivocal CT scan
(N = 20)
Negative CT scan
(N = 123)
Successful NOM
(N = 123)
Immediate OR
(N = 21)
NOM
(N = 44)
Immediate OR
(N = 6)
NOM
(N = 14)
Successful NOM
(N = 12)
OR
(N = 1)
Successful NOM
(N = 43)
OR
(N = 2)
Need IR
(N = 9)

NOTES

Presentation # 44
Friday, 2/25/2022, 8:00am - 8:20am

PROSPECTIVE EVALUATION OF THE SELECTIVE NON-OPERATIVE MANAGEMENT OF ABDOMINAL STAB WOUNDS: WHEN IS IT SAFE TO DISCHARGE?

N OWATTANAPANICH, C CREMONINI, M SCHELLENBERG, K MATSUSHIMA, M LEWIS, L LAM, M MARTIN, K INABA
LAC+USC Medical Center, Los Angeles, California

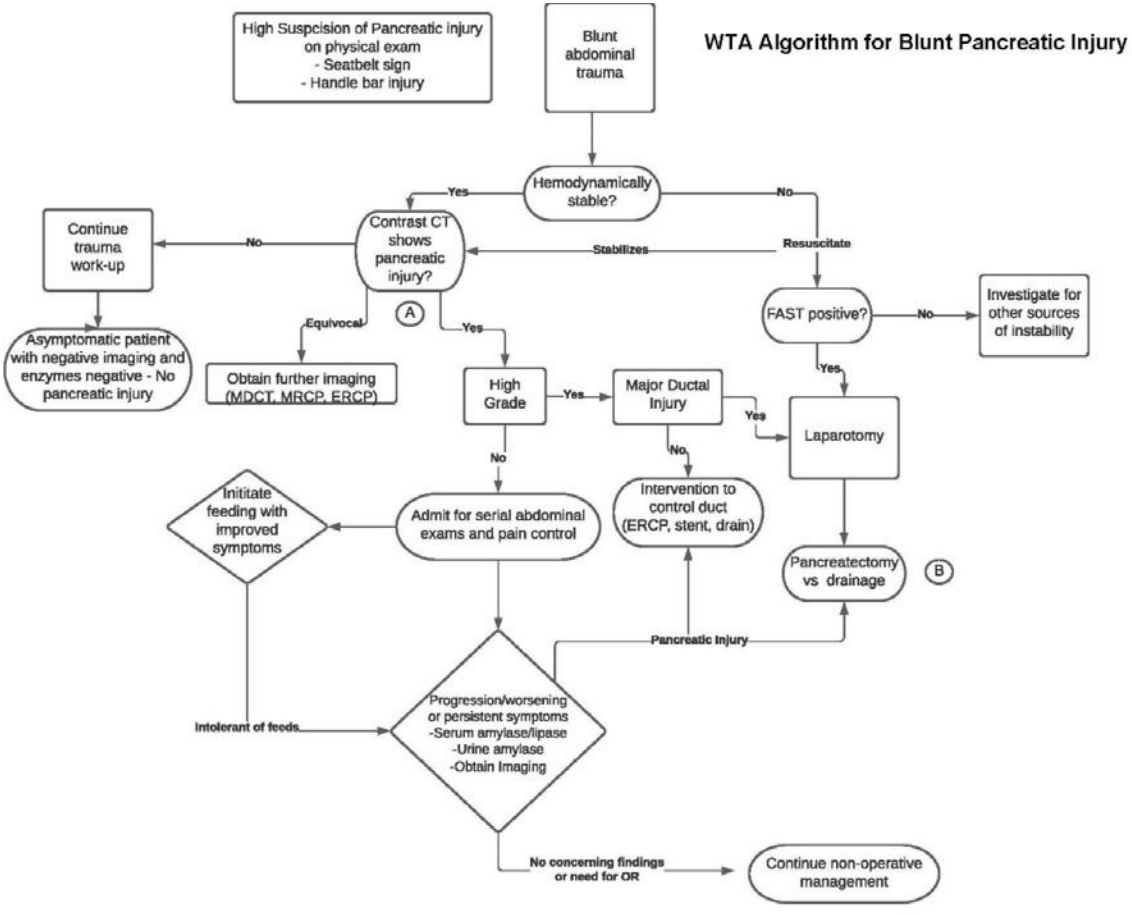
Presenter: Natthida Owattanapanich
Senior Sponsor: Kenji Inaba

INTRODUCTION: The optimal observation time required to exclude hollow viscus injury in patients undergoing nonoperative management (NOM) for abdominal stab wounds (SW) remains unclear. The aim of this study was to determine the safe period of observation required prior to discharge.

METHODS: All patients who sustained a SW to the abdomen undergoing a trial of NOM (07/2018-05/2021) were prospectively enrolled and followed to discharge. Patients sustaining an extra-abdominal SW requiring intervention were excluded. Clinical demographics and outcomes were analyzed. NOM failure was defined as the need for surgical intervention.

RESULTS: During the study time frame, 256 continuous patients were evaluated for an abdominal SW. Mean age 33[26-46], 89% male. 70.7% with single SW, 154(60.2%) had an anterior abdominal SW (most common site RUQ, 25%), 113(44.1%) had flank/back SW. 46(18%) underwent immediate laparotomy based on clinical criteria (evisceration [58.7%], instability [32.6%] and peritonitis [23.9%]. The remaining 210(82%) patients underwent a trial of NOM. 208(99%) underwent CT, of which 27(12.9%) had a positive finding requiring operation and 9(4.3%) an IR intervention. The remaining 174(82.9%) underwent NOM. Of these, 3(1.7%) failed NOM and underwent laparotomy. One had an increasing WBC count, but at laparotomy had no injuries requiring intervention. The other two developed diffuse peritonitis, and at laparotomy had small bowel and gastric injuries. This occurred at 10 and 20 hours after arrival.

CONCLUSIONS: Clinical examination is critical for the identification of patients requiring emergency operation after abdominal SW. For the remaining patients undergoing nonoperative management, observation for a minimum of 24 hours is warranted prior to discharge.


WTA Algorithm for Blunt Pancreatic Injury
High Suspcision of Pancreatic injury on physical exam
- Seatbelt sign
- Handle bar injury
Blunt abdominal trauma
Hemodynamically stable?
Yes
No
Continue trauma work-up
No
Contrast CT shows pancreatic injury?
Stabilizes
Resuscitate
Asymptomatic patient with negative imaging and enzymes negative - No pancreatic injury
Equivocal
A
Yes
Obtain further imaging (MDCT, MRCP, ERCP)
High Grade
Yes
Major Ductal Injury
Yes
FAST positive?
No
Investigate for other sources of instability
Yes
Laparotomy
No
No
Initiate feeding with improved symptoms
Admit for serial abdominal exams and pain control
Intervention to control duct (ERCP, stent, drain)
Pancreatectomy vs drainage
B
Pancreatic Injury
Intolerant of feeds
Progression/worsening or persistent symptoms
-Serum amylase/lipase
-Urine amylase
-Obtain Imaging
No concerning findings or need for OR
Continue non-operative management

Presentation # 45
Friday, 2/25/2022, 8:20am - 8:40am

ALGORITHM 3 – Blunt Pancreatic Injury

Presenter: Alexis Moren, Salem Health

Blunt Solid Organ Injury

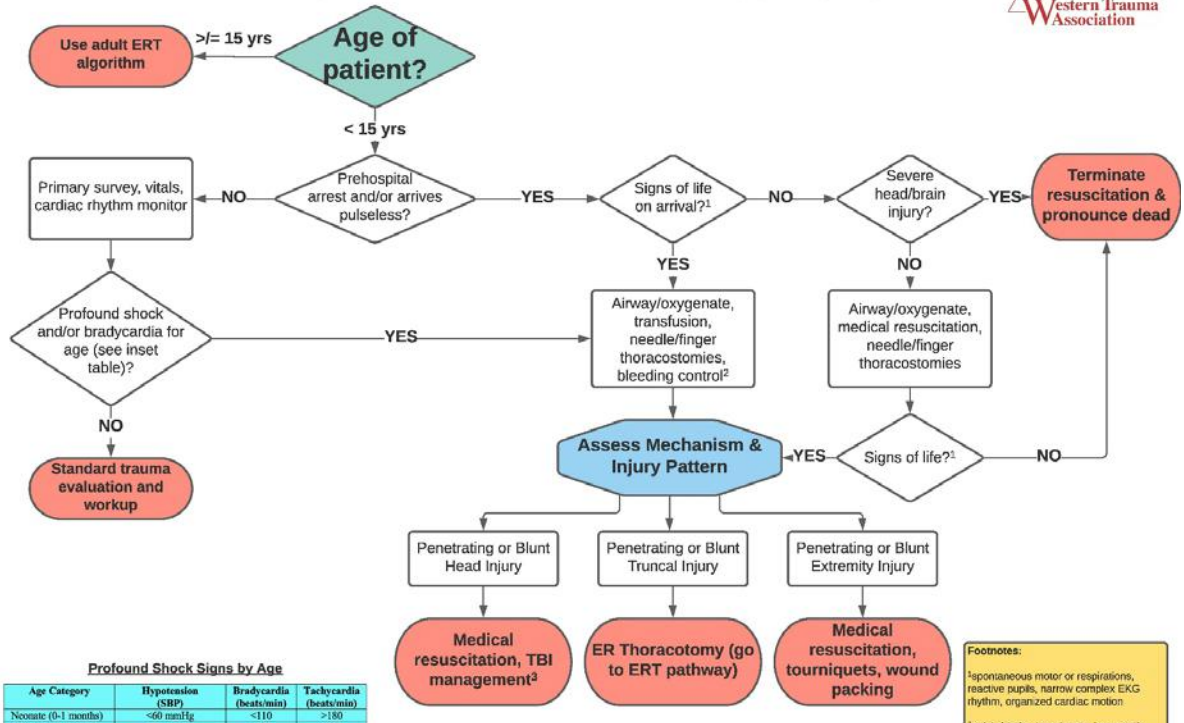
Non-op Management Guideline – Adult

Pancreas Protocol

	LOW GRADE	HIGH GRADE
AAST Grade	**I & II**	**III, IV, V**
ICU	No	Consider admission based on exam and if hemodynamically unstable
Labs	Do not trend	Do not trend. Obtain CBC, amylase, lipase and urine amylase if abdominal exam worsens, fever &/or increase in WBC
Monitoring	Serial abdominal exams, q4h vitals for 24-48hrs	Serial abdominal exams, q4h vitals unless ICU then q1h vitals
Diet	Start enteral feeds once exams improves	Start enteral feeds once exam improves. If no improvement by 7 days consider TPN
Repeat Imaging	No role – repeat if symptomatic	No role – repeat if symptomatic
Hospital Activity	No restrictions	No restrictions
DVT prophylaxis (hours)*	w/I 24 hours	w/I 24 hours w/o other injuries
Discharge criteria (minimum admission time)	Improved abdominal exam and tolerating PO	Improved abdominal exam and tolerating PO
Return to normal activity	No restrictions for pancreatic injuries once clinically recovered	Based off clinical course, intervention and other injuries – no restrictions specifically for pancreatic injuries once clinically recovered

Pediatric Emergency Resuscitative Thoracotomy (ERT) Algorithm

Western Trauma Association



Profound Shock Signs by Age

Age Category	Hypotension (SBP)	Bradycardia (beats/min)	Tachycardia (beats/min)
Neonate (0-1 months)	<60 mmHg	<110	>180
Infant (1-12 months)	<70 mmHg	<100	>170
Child (1-10 years)	<70 mmHg + (age x 2)	<60	>140
Child (>10 years)	<90 mmHg	<60	>110
Additional signs of hemorrhagic shock and malperfusion	delayed capillary refill, pulse pressure <20mmHg, skin mottling, cool extremities, decreased level of consciousness, dulled pain response		

One vital sign abnormality is concerning for shock, and two or more should be considered diagnostic in the absence of an alternate cause. Persistent or worsening severe hypotension with tachy or bradycardia despite initial resuscitation should prompt consideration of immediate emergency resuscitative thoracotomy, particularly with signs of malperfusion

Footnotes:

[1]spontaneous motor or respirations, reactive pupils, narrow complex EKG rhythm, organized cardiac motion

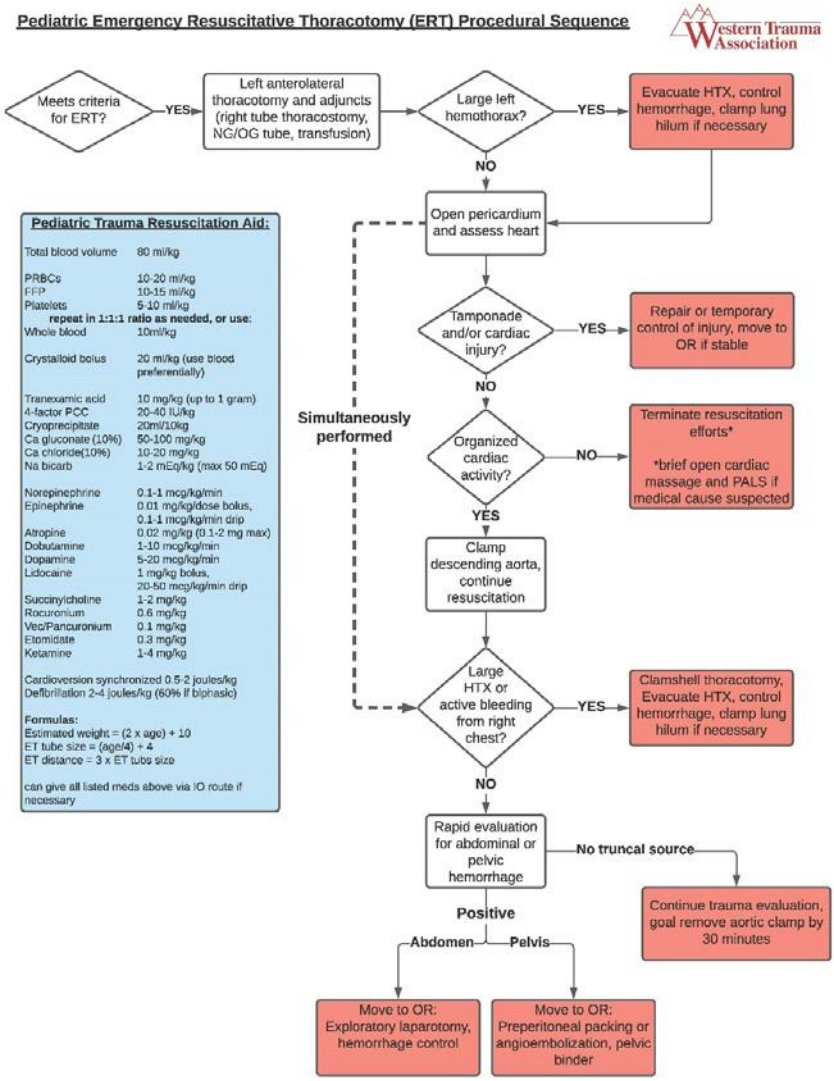
[2]pelvic binder, tourniquets, hemostatic dressings/wound packing, laceration management

[3]Resuscitative thoracotomy may be utilized in highly select cases of potentially salvageable brain injury or for stabilization for possible future organ donation

Presentation # 46
Friday, 2/25/2022, 8:40am - 9:00am

ALGORITHM 4 – Pediatric Emergency Resusitative Thoracotomy (ERT)

Presenter: Matthew Martin, Los Angeles County + USC Medical Center



Component	Average Before	Average After	Significance
Hemoglobin (mg/dL)	12.0 +/-2.8	12.4+/-2.7	**0.034**
Platelets (100,000 cells/mL)	75.5+/-27.3	59.6+/-25.0	0.004
R Time (Minutes)	10.0+/-5.0	8.1+/-2.6	0.014
K Time (Minutes)	4.8+/-3.4	4.7+/-0.9	0.169
Alpha Angle (Degrees)	57.5+/-11.4	57.2+/-1.9	**0.019**
Maximum Amplitude (Millimeters)	49.6+/-6.1	45.1+/-1.4	0.035
LY30 (Percent)	0+/-0	0+/-0	N/A

Bold values represent statistical test of equivalence.

NOTES

Presentation # 47
Friday, 2/25/2022, 4:00pm - 4:20pm

THE EFFECT OF THE BELMONT INFUSER ON WHOLE BLOOD COAGULABILITY

T HOYOS GOMEZ, SJ EL HADDI, S GRIMSTEAD-ARNOLD, MA SCHREIBER
Oregon Health and Science University, Portland, Oregon

Presenter: Tatiana Hoyos-Gomez
Senior Sponsor: Martin Schreiber

INTRODUCTION: With the large-scale use of whole blood in massive transfusion using rapid infusers/fluid warmers such as the Belmont, questions remain as to whether coagulation potency, platelet number, and function are preserved. We aimed to study functional coagulation capacity and cell counts in whole blood before and after infusion through the Belmont rapid infuser utilizing TEG analysis and complete blood counts.

METHODS: We evaluated 10 whole blood units before and after infusion through a Belmont Fluid Management System at a set rate of 200mL/min and a temperature of 37.4°C. Cell counts and thromboelastography function of the specimens were measured. Parameters were compared utilizing paired student's T-tests and paired Wilcoxon Rank Sign Tests with a Two One-Sided Test (TOST) of equivalence in suspected equivalence looking at large differences.

RESULTS: Platelet count, R time, and Maximum amplitude showed significant decreases (defined as $p<0.05$) after being infused through the Belmont. White cell counts and K time were not significantly different but did not have a normal distribution and could not undergo TOST evaluation for equivalence. Hemoglobin, hematocrit, MCV, and alpha angle were all statistically equivalent.

CONCLUSIONS: Use of whole blood in a Belmont infuser, appeared to decrease platelet counts and function as well as activated clotting factors as demonstrated by a shorter R time while not affecting red cell counts or thrombin cross-linking as measured by TEG parameters and cell counts. This suggests that while it is possible to provide whole blood through a rapid infuser, platelet quantity and function may be affected.

	Area	95% Wald Confidence Limits	
tPA challenge TEG LY30 at 12HRS	0.7225	0.5790	0.8661
RAP	0.7208	0.6074	0.8341
TEG LY30 at 12HRS	0.6556	0.5056	0.8055
TEG LY30 24HRS	0.6042	0.4770	0.7314
TESS	0.5992	0.4430	0.7554
MA 24HRS	0.5854	0.4202	0.7506
MA 12HRS	0.5415	0.3765	0.7065
tPA challenge LY30 24HRS	0.5124	0.3459	0.6789

NOTES

Presentation # 48
Friday, 2/25/2022, 4:20pm - 4:40pm

FIBRINOLYTIC SHUTDOWN IS AN EARLY PREDICTOR OF POST-TRAUMATIC VTE: A PROSPECTIVE MULTICENTER STUDY FROM THE CLOTT RESEARCH GROUP

M KNUDSON, H MOORE, E MOORE, M CHAPMAN, L KORNBLITH, L KIRALY, M MCNUTT, C WADE, BRUNS B, A SAUAIA
University of California, San Francisco, San Francisco, California

Presenter: M. Margaret Knudson

INTRODUCTION: VTE remains a frequent post-injury complication despite pharmacological prophylaxis. Fibrinolysis shutdown (FS) has been proposed as a potential contributing cause. We hypothesized that a tPA-challenge thromboelastography (TPA-TEG) suggestive of FS early after major injury would predict VTE events.

METHODS: A subgroup of adults (n=103) enrolled in the CLOTT2 5-center prospective study had tPA-TEG obtained at 12- and 24-hours post-ICU admission. VTE was diagnosed by duplex screening or clinically ordered pulmonary embolism imaging. The predictive performance of TPA-TEG was assessed by areas under the receiver-operating characteristics curve (AUC). These AUCs were compared to standard TEG maximum amplitude (MA), the VTE Risk Assessment Profile (RAP) and the Trauma Embolic Scoring System (TESS). The Youden Index was used to define optimal cutoffs for these variables.

RESULTS: Overall VTE incidence was 16.8%(n=17); 14 DVT, 4 PE, 1 both. Compared to those without VTE, VTE patients were more severely injured (ISS=34 vs 22, p=0.002) and had higher RAP (12 vs 10, p=0.004). TESS was not significantly different (7 vs 5, p=0.20). The tPA-TEG LY30 at 12 hours showed the largest AUC, followed by the RAP(Table). tPA-resistant patients had 3.8 increased odds of developing VTE, while patients with RAP>11 had 4.3 increased VTE odds. However, as the RAP score calculation requires data not available at 12 hours, FS emerges as the most accurate early predictor of VTE events.

CONCLUSIONS: This study has important implications for both the timing of initiation and the choice of agent used for post-traumatic VTE prophylaxis.

Percent missed BCVI by mechanism of injury.

	Denver Criteria: BCVI Missed (N = 132)	Expanded Denver Criteria: BCVI Missed (N = 150)
Number Missed	132 (30.5%)	150 (34.6%)
Ground Level Fall	8 (6.1%)	7 (4.7%)
Fall from Height	4 (3.0%)	4 (2.7%)
MVA	89 (67.4%)	108 (72%)
Auto-Ped	10 (7.6%)	9 (6.0%)
ATV	3 (2.3%)	3 (2.0%)
Assault	3 (2.3%)	3 (2.0%)
Hanging	0 (0%)	1 (0.7%)
Other	15 (11.4%)	15 (10.0%)

NOTES

Presentation # 49
Friday, 2/25/2022, 4:40pm - 5:00pm

MISSED BCVI USING CURRENT SCREENING CRITERIA - THE TIME FOR LIBERALIZED SCREENING IS NOW

J SCHMIDT, D HUANG, A FLEMING, V BROCKMAN, E HENNESSY, L MAGNOTTI, T SCHROEPPEL, K MCFANN, J DUNN
University of Colorado Health Medical Center of the Rockies, Loveland, Colorado

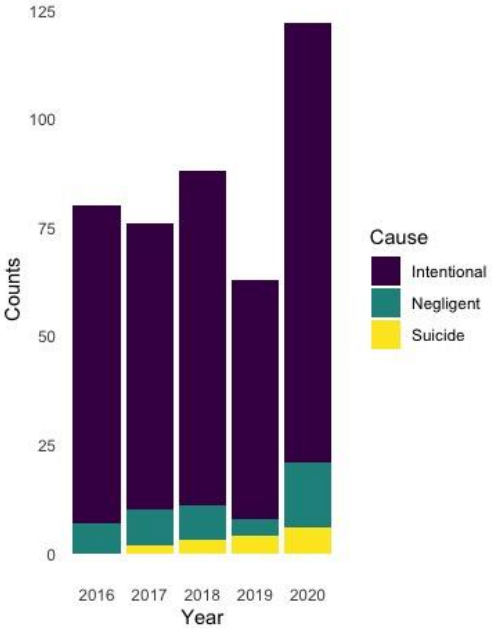
Presenter: Julia Schmidt
Senior Sponsor: Julie Dunn

INTRODUCTION: Morbidity and mortality associated with ischemic stroke attributable to blunt cerebrovascular injury (BCVI) warrants an aggressive screening approach. The Denver Criteria and Expanded Denver Criteria have elements that lack precision and are arduous to apply causing delayed or absent screening. We hypothesize these screening criteria fail to fully identify BCVI and use of a liberalized screening approach with CT angiography (CTA) is better and does not increase risk of acute kidney injury (AKI).

METHODS: This was a multi-institutional retrospective cohort study of trauma patients between 2015-2020 with radiographically confirmed BCVI using a liberalized screening approach defined as CTA for all patients undergoing head and neck CT. Incidences of missed BCVI were tested against liberalized criteria using a binomial test of proportions. A cohort analysis was completed to determine incidence of AKI between patients with CTA vs no CTA.

RESULTS: We identified 433 BCVI patients with a median age of 45.2 (± 18.9) years. Clinical outcomes included stroke (41 patients) and death due to BCVI (12 patients). Of 433 total cases, 132 (30.5%) would have been missed by the Denver Criteria and 150 (34.6%) by the Denver Expanded Criteria ($p < 0.0001$). Incidence of AKI in our BCVI population was 6 (1.4%) compared to 0 (0%) in a matched cohort ($p=0.5960$).

CONCLUSIONS: BCVI would be missed over 30% of the time using the Denver Criteria and Denver Expanded criteria compared to liberalized use of screening CTA. Risk of AKI due to CTA was insignificant compared to matched trauma patients, supporting liberal CTA screening.


125
100
75
50
25
0
Counts
2016
2017
2018
2019
2020
Year
Cause
Intentional
Negligent
Suicide

NOTES

Presentation # 50
Friday, 2/25/2022, 5:00pm - 5:20pm

WHEN PUBLIC-HEALTH CRISES COLLIDE: A MULTICENTER EXAMINATION OF PANDEMIC EFFECTS ON PEDIATRIC FIREARM-RELATED INJURIES

LC TATEBE, J CONE, M SLIDELL, G CHANG, J OURIEFF, M JONIKAS, V SCHLANSER, AJ DENNIS
Cook County Health, Chicago, Illinois

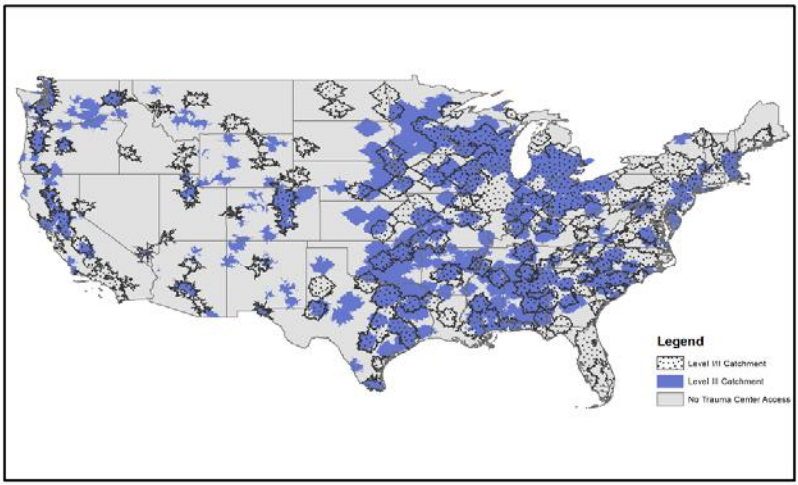
Presenter: Leah Tatebe
Senior Sponsor: Andrew Dennis

INTRODUCTION: Firearm-related injury remains a leading cause of pediatric death. Pandemic stay-at-home orders, school closings, and heightened social stressors have changed what are children are facing and prevention strategies need to be adapted.

METHODS: A multicenter regional retrospective chart review was performed for firearm-related injuries in patients 15-years-old and under at 3 urban Pediatric Level 1 Trauma Centers between January 2016 and December 2020. Age, gender, race/ethnicity, injury severity score (ISS), reported cause of injury, timing of injury around school and curfew, and mortality were evaluated. Medical Examiner data identified additional regional deaths.

RESULTS: There were 546 injuries including 67 from the Medical Examiner. Overall, 80.4% were male with median age of 14 years (range 0-15; IQR 12-15), and median ISS of 5 (IQR 1-16). African-American children comprised 78.8% of the cohort while only representing 35.9% of local schools. Intentional interpersonal injuries comprised 68.1%; 7.7% were negligent discharges; and 2.7% suicide. One child died after a police-involved shooting. Median age for intentional interpersonal injuries was 14 years (IQR 14-15) compared to 12 years (IQR 7-15, $p<0.001$) for negligent discharges. More injuries were seen after the Stay-At-Home-Order and suicides were increasing linearly ($p=0.001$). 5.6% of injuries occurred during school hours; 57.7% after school or during non-school days; and 36.7% were after legal curfew. Mortality rate was 21.4%

CONCLUSIONS: Children are suffering firearm-related injuries at an increasing rate. We have lost ground during the pandemic. We need to double-down on multifaceted prevention initiatives beginning in the pre-teen years and include de-escalation, safety, and suicide-risk training.


Legend
Level III Catchment
Level II Catchment
No Trauma Center Access

NOTES

Presentation # 51
Friday, 2/25/2022, 5:20pm - 5:40pm

ACCESSIBILITY LEVEL III TRAUMA CENTERS FOR RURAL COMMUNITIES

M JARMAN, M DALTON, R ASKARI, K SONDERMAN, K INABA, A SALIM
Brigham and Women's Hospital, Boston, Massachusetts

Presenter: Molly Jarman
Senior Sponsor: Kenji Inaba

INTRODUCTION: Level III trauma centers can extend high quality care to rural communities through rapid assessment/stabilization of injured patients at community hospitals, followed by admission or transfer. We sought to determine how many rural residents benefit from access to Level III trauma centers.

METHODS: Using 2020 Trauma Information Exchange Program data, we mapped one-hour driving catchment areas for trauma centers in the continental US. Census block-group data from the American Community Survey were overlaid with catchment areas to estimate characteristics of the populations with access to Level I/II centers, Level I/II/III, Level III only, and without access.

RESULTS: We identified 589 Level I/II centers and 499 Level III centers. An estimated 200M US residents lived in Level III catchment areas, most of whom (90%, N≈181M) also had access to a Level I/II center. Of the 39M US residents without access to a Level I/II center, half did have access to a Level III center, representing 6% of the US population (N≈19M). While 16% of rural residents (N≈5.3M) did not have access to any trauma center, 14% of rural residents (N≈4.6M) had access to Level III centers, but not to Level I/II centers.

CONCLUSIONS: The presence of Level III centers extends the reach of the US trauma system to millions of people who do not otherwise have timely access to trauma care; however, geographic barriers to care persist for many rural communities. Ongoing efforts to expand access to trauma care in rural settings

	Trauma Centers			
	Level I/ II	Level III/IV	No Designation	Total
n, (%)	569 (19.2)	769 (26.0)	1,625 (54.8)	**2,963 (100)**
ISS Mean (SD)	10.0 (5.64)	8.8 (4.72)	8.5 (4.38)	**9.6 (5.33)**
Total hospitalizations n, (%)	233,180 (66.9)	40,564 (11.6)	75,056 (21.5)	**348,800 (100)**
Transfers-in n, (% of center total)	54,278 (23.3)	4,413 (10.9)	8,330 (11.1)	**67,021 (19.2)**
SDH (1º diagnosis) n, (%)	103,094 (44.2)	17,134 (42.2)	33,656 (44.8)	**153,884 (44.1)**
SAH (1º diagnosis) n, (%)	50,074 (21.5)	6,810 (16.8)	12,460 (16.6)	**69,344 (19.9)**
Medicare Payment, $B (%)	3.60 (73.4)	0.45 (9.1)	0.86 (17.5)	**4.91 (100)**

Abbreviation: SDH, subdural hemorrhage; SAH, subarachnoid hemorrhage; 1º = primary

NOTES

Presentation # 52
Friday, 2/25/2022, 5:40pm - 6:00pm

THE BURDEN OF GERIATRIC TRAUMATIC BRAIN INJURY WITHIN ORGANIZED TRAUMA SYSTEMS: DEMOGRAPHICS, CARE LOCATION, DIAGNOSES, AND CMS PAYMENTS IN 348,800 MEDICARE INPATIENT CLAIMS

S FAKHRY, Y SHEN, J GARLAND, N WILSON, R WYSE, J MORSE, D HUNT, D ACUNA, J DUNNE, S KUREK, S IRELAND-GORDY, D WATTS
Center for Trauma and Acute Care Surgery Research / HCA Healthcare, Nashville, Tennessee

Presenter: Samir M. Fakhry
Senior Sponsor: Stephanie Ireland Gordy

INTRODUCTION: Traumatic Brain Injury (TBI) is a leading cause of death and disability in geriatric patients. Research gaps in geriatric TBI care may limit trauma system planning. The aim of this study was to characterize the burden of geriatric trauma by describing demographics, care location, diagnoses, outcomes, and payments in this high-risk group.

METHODS: Using 2016-19 CMS Inpatient Standard Analytical Files (IPSAF), patients aged >65 with TBI (>1 injury ICD-10 starting with "S06") were selected. Trauma center levels were linked to the IPSAF file via AHA Hospital Provider ID and fuzzy-string matching. Patient variables were compared across trauma center levels.

RESULTS: 348,800 inpatients (50.4% female; 87.1% white) from 2,963 hospitals were included. Level I/II centers treated 66.9% of patients; non-trauma centers treated 21.5%. Overall inter-facility transfer rate was 19.2%; in Level I/II centers transfers-in represented 23.3% of admissions. Severe TBI (Head AIS ≥3) was present in 70.0%. Most frequent diagnoses were SDH (44.1%) and SAH (19.9%). Neurosurgical operation was performed in 10.1%. Overall mortality was 8.1%. Medicare payments totaled $4.91B, with the majority (73.4%) to Level I/II centers (Table).

CONCLUSIONS: This study fills a gap in geriatric TBI research by demonstrating that although the majority of geriatric TBI patients receive care at Level I/II trauma centers, a substantial percentage are managed at other facilities, despite 1 in 10 requiring neurosurgical operation. This analysis provides preliminary data on the function of regionalized trauma care for geriatric TBI. Future studies assessing the efficacy of early care guidelines in this population are warranted.

NOTES

WESTERN TRAUMA ASSOCIATION
648 Waterfield Drive
Batavia, IL 60510

Telephone: 678.675.2696
Fax: 678.668.7312
Web: www.westerntrauma.org
Email: carrie@westerntrauma.org

COMMERCIAL SUPPORT

The Western Trauma Association wishes to recognize and thank the following company for monetary commercial support:

UCHealth

COMMERCIAL PROMOTION

The Western Trauma Association wishes to recognize and thank the following companies for their commercial promotion towards this educational activity:

410 Medical Inc.

Astra Zeneca

Arcos, Inc.

AtriCure, Inc.

CLR Medical

CSL Behring

Front Line Medical Technologies

Haemonetics

KLS Martin

Prytime Medical Devices, Inc.

Synapse Biomedical Inc.

Teleflex

Werfen

Zimmer Biomet